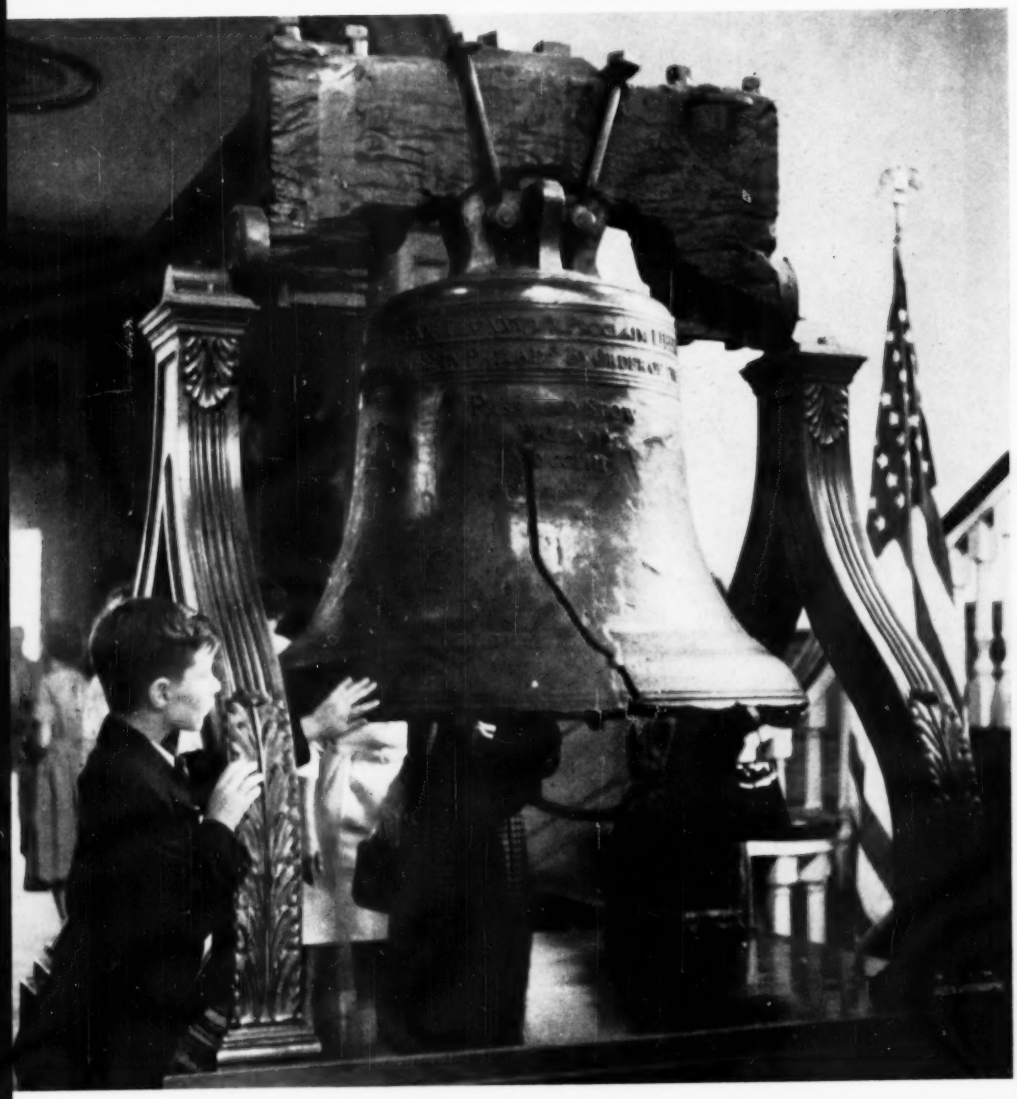
Compressed Air Magazine



JULY 1960

IN THIS ISSUE:

BLAST HOLES FOR WORCESTER DIVERSION PROJECT DRILLED WITH BETHLEHEM HOLLOW

This 16-ft-diameter tunnel was driven a total of 4150 ft for the Worcester Diversion Project. This was a flood-control job, constructed recently on the Blackstone River, near Auburn, Mass. The project was under the supervision of the New England U. S. Army Engineers Division, Corps of Engineers. The holes for the blast charges were bored to an average depth of 6 ft, using Bethlehem Hollow Drill Steel. The contractor was Kero-Curly Corp. Bethlehem Hollow Drill Steel is ideal for all types of rock drilling because of its economy and dependability. It is furnished in Carbon and Ultra Alloy grades in rounds, hexagons, and quarter octagons, in lengths from 18 ft to 27 ft.

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PARTNERS IN PERFORMANCE

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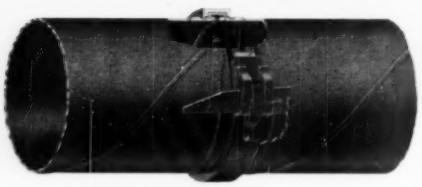

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Volume 65 Number 7

July 1960

Compressed Air MAGAZINE

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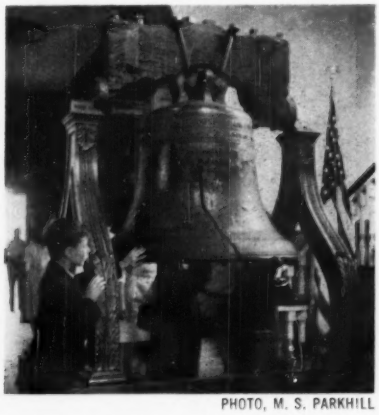
Editorial, advertising and publication offices: 942 Memorial Parkway, Phillipsburg, New Jersey. Annual subscription, United States and possessions, $5; foreign, $7; single copies, domestic $0.50, foreign, $0.70. Compressed Air Magazine is indexed in Industrial Arts Index and in Engineering Index. Microfilm volumes (1940 to date) are available from University Microfilms, Inc. Published monthly by Compressed Air Magazine Company: A. W. Loomis, President; L. C. Hopton, Vice President; C. H. Biers, Secretary-Treasurer.



PHOTO, M. S. PARKHILL

on the cover

Venerate symbol of patriotism and liberty throughout the world, the Liberty Bell was ordered from England in 1751. It was inscribed "Proclaim Liberty" as a fiftieth anniversary memorial to William Penn's Charter of Privileges. The bell received its present name from this, not from its use in tolling the important events of the American Revolution. The bell was cracked during testing. John Pass and Charles Stow Jr., of Philadelphia, recast it. The tone was unsatisfactory and it was cast a third time—the one shown above. During the Revolution, it was buried in Allentown, Pa., and was returned to its Independence Hall home after the British left the city. Tradition has it that the present crack resulted when it tolled the death of Chief Justice John Marshall in 1835.

Departments


“20,000

LEAGUES UNDER THE SEA"

U.S.S. TRITON sails around the world under water, through the modern miracle of atomic power

In 1869, Jules Verne penned the dream of a fantastic undersea vessel – the "Nautilus" – powered by the inexhaustible energy of elemental fires. Yet yesterday's fiction is today's fact. And the U.S.S. Triton – the world's largest atomic-powered submarine – has sailed around the world *under water*. It covered 41,500 miles in 84 days, with the hull submerged at all times. In this single, history-making trip, the Triton covered almost the entire "20,000 leagues" of all the undersea wanderings of the fabulous craft of Jules Verne's novel.

Like practically all of America's atomic-powered submarines, the Triton is equipped with specially-designed high-pressure boiler-feed pumps by Ingersoll-Rand – pumps which operated *continuously and faultlessly* during this famous 84-day undersea voyage, to keep the nuclear-fired steam generators supplied with water.

Also aboard the Triton were Ingersoll-Rand high pressure air compressors for hull pressure control, ballast blowing and torpedo ejection, and Ingersoll-Rand main-feed booster pumps and main seawater circulating pumps.

Long before the first nuclear vessel – the U.S.S. Nautilus – slid down the ways in 1954, many new problems of design and construction had to be solved – from the power plant to the innumerable items of essential auxiliary equipment. To help make this engineering dream come true, Ingersoll-Rand has designed and built highly specialized equipment for America's fast-growing nuclear fleet of submarines and surface vessels as mentioned in the listing below.

For nearly a century, Ingersoll-Rand equipment has been making engineering dreams come true all over the world. Whatever your requirements for pumping liquids, compressing gases, condensing steam, drilling rock or putting air power to work, *think first of Ingersoll-Rand.*

INGERSOLL-RAND EQUIPMENT ON NUCLEAR VESSELS

N/S Savannah
The world's first nuclear-powered merchant ship has Ingersoll-Rand steam condensers, in-port boiler-feed pumps and air compressors for pneumatic controls.

U.S.S. Long Beach
The world's first atomic-powered cruiser will use Ingersoll-Rand main boiler-feed pumps and main-feed booster pumps.

Nuclear Submarines
Main boiler-feed pumps for all submarines launched or in service. Many of the submarines have various other Ingersoll-Rand pumps and high-pressure air compressors for services like hull-pressure control, ballast blowing, torpedo ejection and missile launching.

U.S.S. Bainbridge
World's first atomic-powered destroyer will have Ingersoll-Rand main boiler-feed pumps aboard.

U.S.S. Enterprise
World's first nuclear-powered aircraft carrier will be equipped with Ingersoll-Rand high-pressure air compressors.

Ingersoll-Rand

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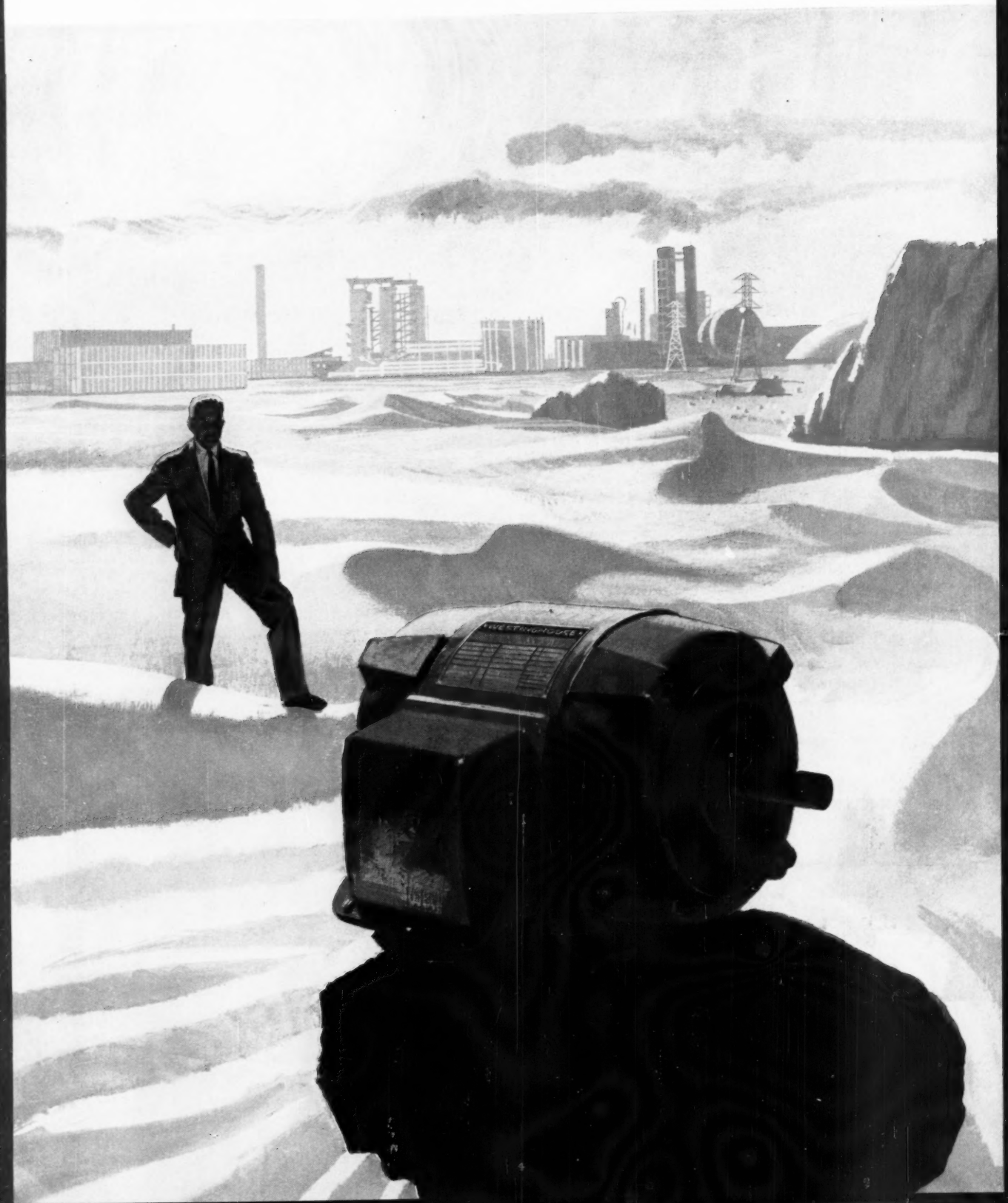
New *Guardistor*

THE MAN & THE MOTORS



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"With the breakthrough development of the Westinghouse Positive Temperature Coefficient thermistors, for the first time we can provide inherent protection against motor failure caused by excessive heat. The solid-state thermistors buried in the windings instantly sense excessive heat from any cause and simultaneously warn of trouble or automatically take the motor off the line. Thus, motor protection is placed where only true motor protection can be . . . in the windings."

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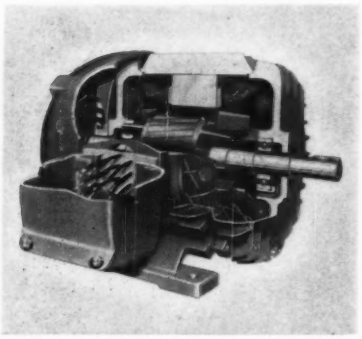
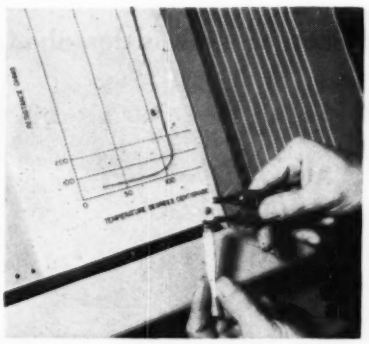


Unlike remotely located sensing devices, PTC thermistors are buried in the windings of the Guardistor motor, instantly equating all temperature factors.



Ever alert PTC thermistors constantly totalize temperature, statically triggering an action *only* if critical temperature is reached.

MOTOR & GEARING DEPARTMENT

YOU CAN BE SURE...IF IT'S

Westinghouse

TUNE IN WESTINGHOUSE CBS TV RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

NAPOLEON issued the Berlin and Milan decrees in 1806 and 1807 to blockade England. Neither neutrals nor French allies could trade with her or her colonies. This continental system had far-reaching effects on the next hundred years of both English and French trade and internal development. Like all diplomatic moves, it was also felt by the common man and private enterprise. Many businesses throughout what the Emperor called "the nation of shopkeepers" either collapsed or changed their pattern of growth.

One such private industry was the loom-equipment venture of James and Patrick Clark. They had been selling imported silk thread for the heddles of the famed shawl weavers in Paisley, Scotland. The blockade forced them to replace the silk with cotton. Their first spinning mill opened in 1812 and produced so strong and smooth a thread that silk heddles were never used again.

Watching with interest was an able competitor, James Coats. He too made cotton thread and sold it in hanks, much as some yarn is retailed today. In time, J. & P. Coats and the Clark Brothers gained pre-eminence among suppliers to needle workers. Both had agents in New York City by the 1840's. With the advent of the American Civil War and the abundant difficulties of importing thread, George and William Clark decided to manufacture in the United States and opened a factory in Newark, N. J., in 1864. In 1870 J. & P. Coats purchased interests in a Pawtucket (R. I.) mill.

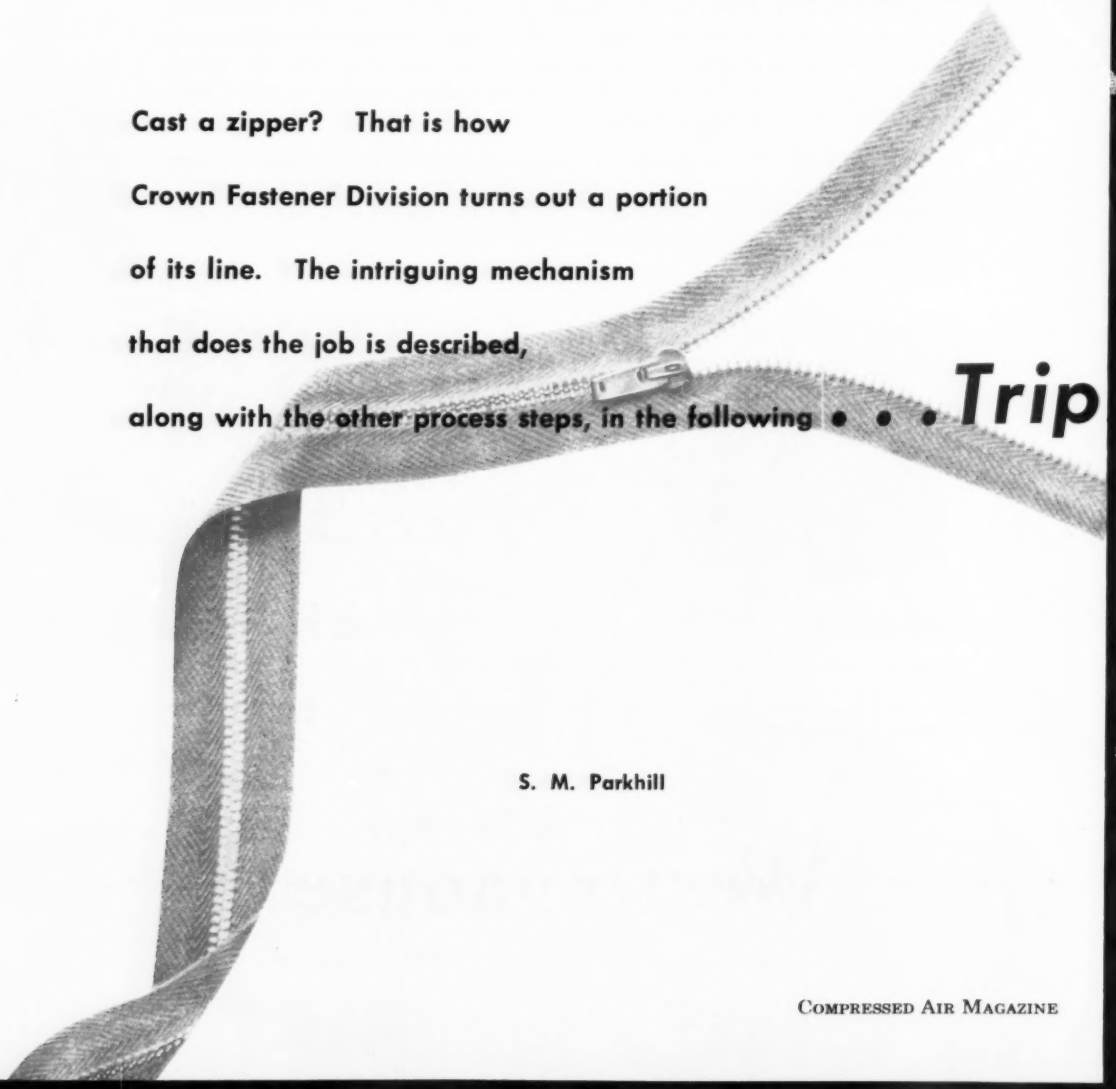
Before 1900, the onetime competitors were operating under single management, although they maintained separate corporate identities until their formal merger was announced in 1952. Today, Paisley is the home of the large mills of J. & P. Coats Ltd., direct descendent of the two family enterprises. In the United States, there are eight thread mills located in Rhode Island and Georgia, and the business is headed by a fifth generation Clark, John Balfour Clark.

One Pull

Just prior to the Coats' and Clark's consolidation, events were taking place in Chicago, Ill., that were to have special significance to the firm. Whitcomb L. Judson, inventor of some pneumatic street railways, was exasperated with lacing his shoes one fastener at a time. He wanted a mechanism that would do the job with one tug. The zipper, though it was not called by that name for 3 decades, was born of this irritation. Judson's first patent was issued in 1893 under the title "Clasp Locker and Unlocker for Shoes," and his slide fasteners were displayed at the World's Columbian Exhibition that year.

Just after the turn of the century, Judson obtained a patent on a machine to produce his fasteners, but the equipment was complicated and difficult to operate. The theory of the slide fastener was sound, but the devices themselves were

Cast a zipper? That is how Crown Fastener Division turns out a portion of its line. The intriguing mechanism that does the job is described, along with the other process steps, in the following • • • Trip



S. M. Parkhill

not really satisfactory and were impractical to manufacture.

Development continued. A patent issued in 1905 shows fastening elements clamped around the beaded edge of a tape, very similar to the modern zipper. This slide fastener was more adaptable to quantity machining than was Judson's first one. However, the two sets of fastening elements were not identical as they are today. The device was peddled door-to-door under the trade name *C-curity* and the slogan "Pull and It's Done." Significantly, the garment industry was uninterested in novelties."

From 1905 on, other inventors were invading Judson's bailiwick. Gideon Sundback, a Swiss electrical engineer, joined Automatic Hook & Eye Company, Hoboken, N. J. Sundback's work dealt primarily with eliminating the insecurity of the *C-curity*. When ladies sat down, the bending frequently caused the fastening elements to become unlocked. Plako, chiefly for dress plackets, was developed. Though an improvement, it was still thought a novelty and the garment industry could see no general applications. Plako did find a limited market in theatrical costumes for quick-change artists.

Sundback continued trying to produce a practical slide fastener that could also be easily machined. On March 20, 1917, a patent was granted for a device that is essentially the modern zipper. Made by a stamping process, the Hookless No. 2, as it was called, was not bulky, but was light in weight and extremely flexible. It did not easily unlock with twisting or bending and was practical to manufacture, for all of the fastening elements were alike and interchangeable.

Acceptance

Hookless No. 2 achieved its initial success in money belts made for the A. E. F. of World War I. Of the 24,000 zippers sold during 1917, most were used on these belts. They became the first articles of clothing to use the slide fastener on a wide scale. The following year, the U. S. Navy standardized on the Hookless No. 2 for its flying suits. In 1919, a glove manufacturer in Gloversville, N. Y., began using the device. The same firm also made tobacco pouches with zippers, the popularity of which gave Sundback's fastener its greatest publicity.

B. F. Goodrich adopted the slide fastener in galoshes. These rubber footwear were christened Zippers by President Bertram C. Work. For years the trade name was zealously protected by Goodrich. To this day, dictionaries refer to the word with a capital "Z," but as a concession to popular fashion, indicate a generic second definition.

By 1925, 5,500,000 zippers were being produced in the United States. The word was on everyone's tongue including Aldous Huxley's standardized human products in *Brave New World*. The novel, published in 1932 when zippers were in their infancy, gives the fasteners great importance. Such words as Zippi-camiknicks and games as hunt-the-zipper appear frequently. The applications dreamed of by Huxley probably seemed fantastic then, but when the uses of zippers known today is tallied, his imagination seems quaint.

Most zippers had shortcomings. Yet, 90 million were produced in America in 1935. Coats & Clark observed with interest, looking for a practical, workable fastener. Such a device was being made by Crown Fastener Corporation, New York City. Coats & Clark purchased a major interest in the firm in 1936, and the companies began working together. On December 31, 1954, Crown Fastener Corporation was merged into Coats & Clark, and has operated as a division of the latter since that date.

Coats & Clark had facilities for making tapes, as well as thread, at its mills, and Crown Fastener applied color co-ordinated zippers. *Dyed to Match* became its well-known marketing slogan.

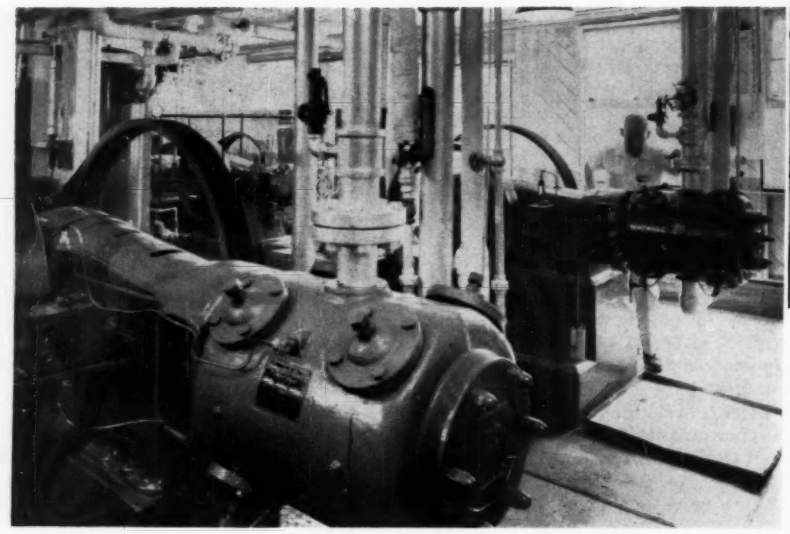
---

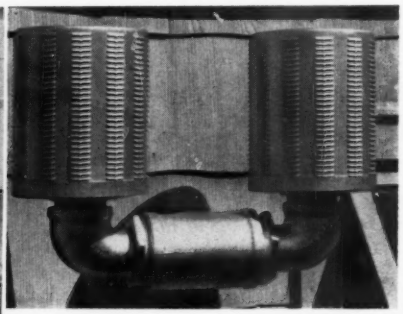
through a zipper plant

ALL ZIPPERS are essentially alike. Their subtleties—manufacturers' quirks of design, treatment of metal, even the metal itself—make one variety superior to another. Crown Fastener Division developed a die-casting process, as opposed to the more prevelant stamping methods, that gives its zippers certain inherent qualities: teeth that neither loosen nor jam; zippers that operate easily because of their cast-round edges; and fasteners that work more easily with use because of the bearing-type metal used in the casting. Crown Fastener is the only manufacturer that produces the die-cast metal zipper.

Coats & Clark maintains two zipper plants in its Crown Fastener Division—one at Warren, R. I., which is the older and larger; and one at Newport News, Va. At the outbreak of World War II, when *zip your lip* was the caution, more than 500 million zippers were being made annually. During the war, Crown Fastener, then said to be the third largest manufacturer, discontinued civilian production. After the conflict, the zipper industry mushroomed to fill civilian needs. The Warren facilities were not large enough to cope with orders while at the same time continuing research and government work. Further, the northeastern labor market was too small. In 1946, the company purchased a laundry from a wartime port of embarkation in Newport News. Shipyard layoffs resulting from a slack in military orders made labor plentiful.

One of the first jobs in converting the





AIR SYSTEM **Air for the compressors is filtered through Dollinger filters (right), and is then compressed in either a high- or low-pressure system. Three of the five compressors in the high-pressure complex are shown above. Each is an 8x9-inch ES-1 of Ingersoll-Rand manufacture, and is driven by a 25-hp induction motor. The compressor shown in the right background is driven by a Westinghouse motor; the others are driven by General Electric Company 60-cycle, 3-phase V-belt motors.**

building was to install a compressor plant; both high- and low-pressure air is used in numerous applications, with the greatest quantities being consumed by the die casters. The set-up today consists of six compressors, one of which supplies low-pressure air. Of the remaining five machines, four are Ingersoll-Rand 8x9-inch ES-1's rated at 130 cfm. The fifth is a similar unit manufactured by Canadian I-R and rated at 135 cfm. All are regulated by on-off control and are V-belt connected to their individual drivers—three made by General Electric; one, Westinghouse; and the fifth, English Electric Company of Canada—each a 60-cycle, 3-phase, 25-hp induction motor. Incoming air is passed through Dollinger filters before being compressed to 135-psig pressure. It is delivered from a receiver in the compressor house through 2-inch lines under plant floors.

Terminology

The zipper is not a mystery; it *is* complicated. Take a moment to inspect one and the workings are clear. To understand how one is made it is necessary to have the names of the components. The fabric edge is called *tape*. Sewn or woven on it is the *bead*. Interlocking teeth (*scoops*) are secured respectively to the bead edge of the tape. These are the fastening elements. Each is exactly alike and is essentially a hook-and-eye mechanism. The size of the zipper is determined by the over-all cross-section of the teeth (scoops). As the zipper size increases, the number of scoops decreases. Fasteners are made in sizes 2, 3, 5, 6, 7, 8, and 10, No. 2 being lightweight for fashion trade and No. 10, for heavy uses.

Design of scoops will also vary, although to the casual observer they have not changed considerably in a long while. At one time they were rectangular in shape, interlocking like a row of bricks up a building. Others have looked like chevrons when closed. The most recent development has been the Wing Sweep zipper for luggage and heavy-duty service. Each scoop has a small metal flange (as illustrated) that projects over the cloth tape. The slider runs on these rows of flanges, thereby eliminating all tape abrasion.

A zipper is closed by a *slider*, but could be closed manually with much effort. The slider only acts as an invisible hand. To prevent this closing mechanism from running off the extremities, *stops* are placed at both the top and bottom.

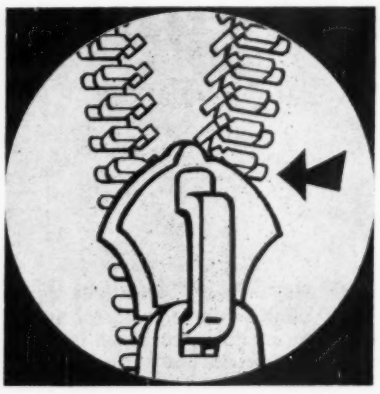
The automatic slider consists of four parts. The *rider* is the bulk of the slider. On this are the *spring*, *handle* and *yoke*. The spring maintains tension when the slider is "locked" with the handle in the down position, that is when two prongs on the underside of the yoke secure the slider against the scoops. This prevents the fastener from coming open when it is under tension.

Because sliders are needed in a wide variety of sizes and styles, some are purchased at Newport News, others are manufactured at the site. Assembly of Auto-lock sliders is made manually when the demand is small and by automatic machinery as the volume needed increases.

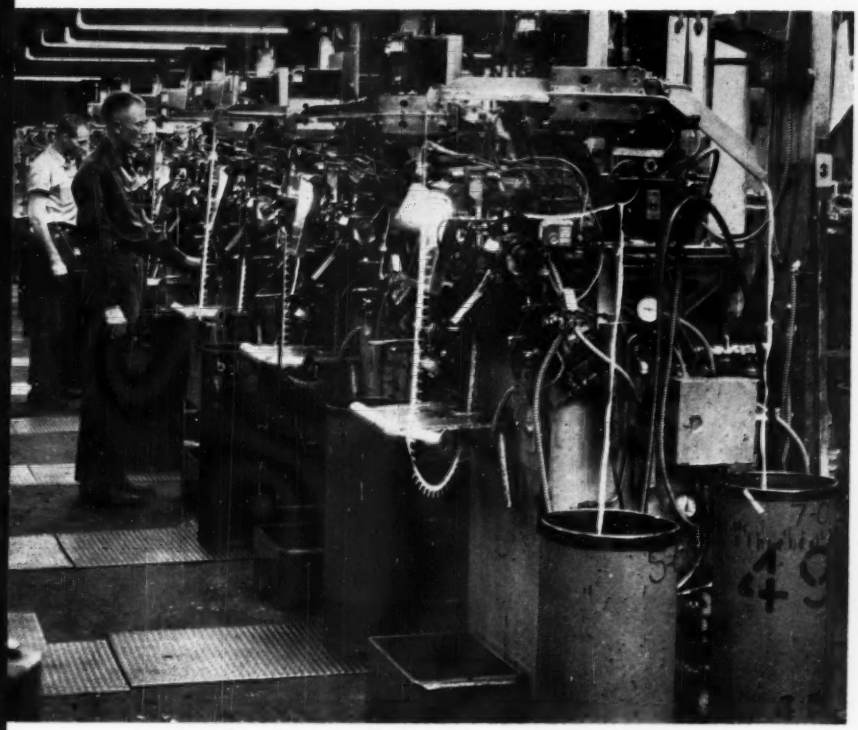
The sliders are next enameled. Rows of sliders are placed on long bars that move along a double track through the painting operation. Six air guns operating on 10-psig pressure (reduced from 30 psig through a regulator valve) spray one side with enamel. The sliders are automatically inverted and are sprayed on the reverse side. Moving continuously, they are air dried for 15 minutes before being baked at 330° F for another 15 minutes. The completed units are stored in bins until needed at the zipper assembly and inspection station.

Die Casting

Two methods of producing zippers can be seen at the Newport News facility. The inexpensive end of the line is made by stamping the scoops out of aluminum, nickel silver or brass wire. Chain is turned out at a rate of 1000 yards every hour, and the zippers thus manufactured are not enameled. The high-grade line is produced on injection molding machines capable of producing hundreds of yards per hour. They operate on much the same principle as a linotype machine. Two pigs of Zamak 5, a zinc alloy fur-



VARIATION **Newest development of Crown Fastener Division is the Wing Sweep. The arrow points to flanges cast on the outside edges of the scoops. The slider rides on these flanges, thereby eliminating fabric wear. The Wing Sweep promotes durability and is especially useful in luggage and articles that receive constant and rough usage.**



CASTING DEPARTMENT A group of injection-molding die-casting machines. These units average 12.5 feet of chain per minute, which is piled in the numbered fiberboard containers that stand by each caster. From here the chain is taken to joining stations and is eventually cut into zippers.

nished by New Jersey Zinc Corporation, are melted by gas-air heat at the rear of each machine. The liquid is maintained at 800° F by electric pyrometers—one for each caster—and the pigs are automatically fed into the molten mass. On the average, two pigs per machine will last about 6 hours of continuous operation.

The molten metal is sucked into a gooseneck valve by a piston operating on 80-psig air pressure. On the downstroke, grooves in the piston close the intake orifice and force the metal through a $^1/_{16}$-inch aperture into the cavity of a 2-part, 1-inch die. This casts a number of scoops around the edge of the tape, depending on the zipper size. (The dies are carefully gauged; when wear exceeds 0.003-0.004 inch, they are scrapped. On an average, one die will last 250 hours.)

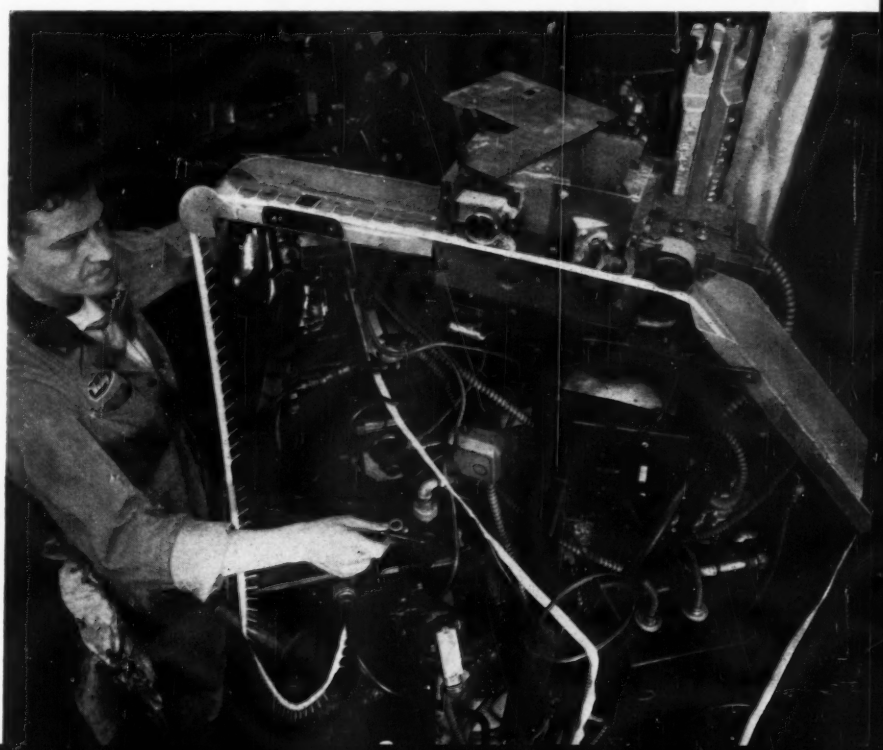
The dies clamp around the tape leaving a 0.006-inch opening between each die half, with the tape between. This space is maintained by 135-psig air pressure acting on a piston. Immediately after the zinc has been cast, the dies retract and the tape is pulled into the next casting position by gripper fingers, also activated by 135-psig-pressure air.

This cycling continues rapidly, automatically casting inch after inch, and spacing lengths of chain that will eventually become the finished lengths of zippers. For example, if 4-inch zippers are wanted, the machine will cast 4 inches of scoops, then automatically pass 2 inches of bare tape before it casts the next 4 inches. This tape without castings will eventually become the ends of a finished zipper. Casting and spacing, as well as the operation of the entire machine, is pneumatically regulated by a rotary timer valve, operating at 135-psig pressure.

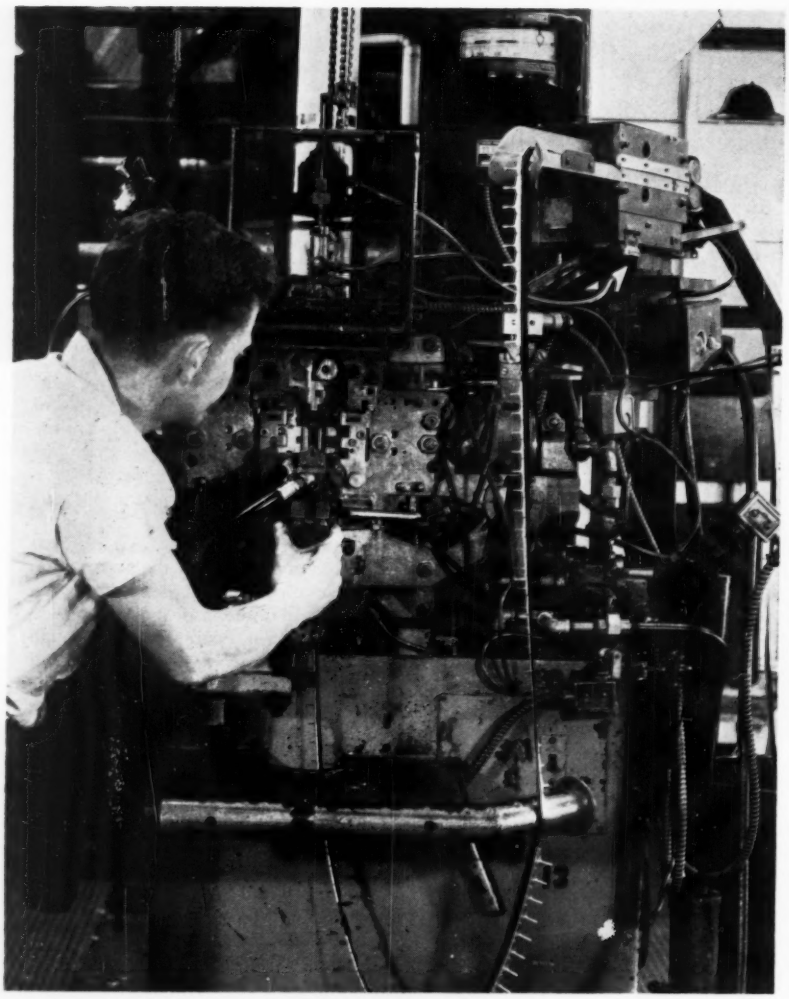
The dies are cooled with water held at 53° F. It is recirculated through a common reservoir. Other than this reservoir, each caster is an integral unit.

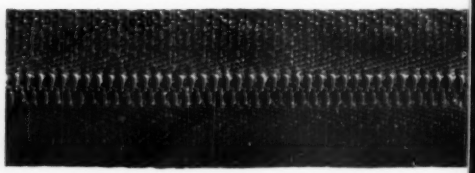
The cast chain moves upward through an electrically driven circular shearer and milling attachment on the top of the caster. The bead and tape ride through on a track as the gate (that part of the hardened metal that results from the casting and joins the individual scoops on the side opposite the tape) is sheared off and the scoops are milled smooth. Trimmed metal is fed back to the melting box. This completes the chain, which is automatically piled in fiberboard barrels ready for joining.

Each casting machine is equipped with a number of safety devices to prevent possible injury from the highly pressur-

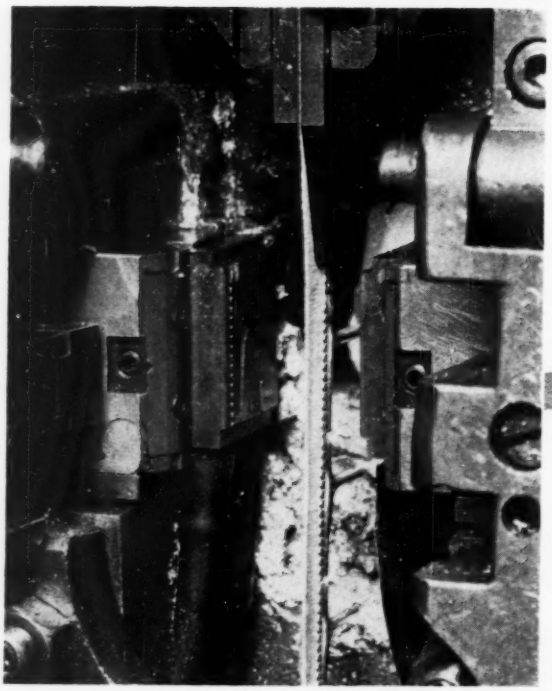


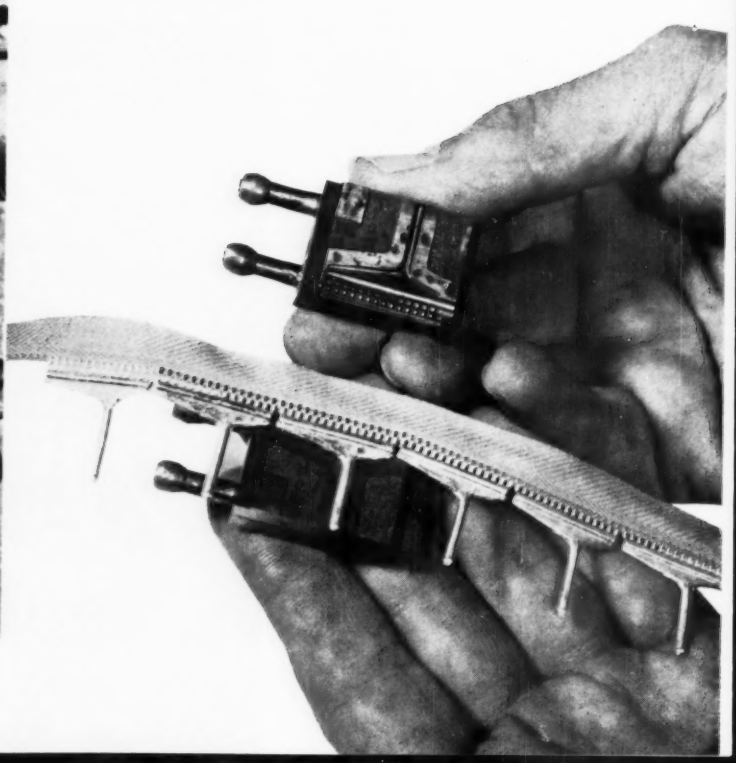
DIE CASTING A single caster is shown at right. The chain can be seen in all stages of completion. As it swings up from the lower left just after it leaves the casting dies, projections called gate are clearly visible. These are trimmed on the circular cutter and mill mechanisms at the top of the unit (shown with top removed for editorial purposes). Spacings between the lengths of castings (as directly above the operator's arm) will eventually become the ends of the tape on the completed zippers. After milling, the chain slides down the chute into a waiting container. In the background are two pigs of Zamak 5, and beneath them but out of sight in this view, is the box containing the molten metal. Constant check is maintained on the wear of the dies, on the tape to be sure it is not distorted, and on scoops to see they are well formed and firmly attached.





CASTER DETAIL Looking directly at a die caster with the safety glass panel in front of the dies raised (upper left). Tape enters from the right (at about eye level, but hardly discernible here) and is pulled down through the die section directly above the operator's hand. Gripper fingers, pneumatically operate at a pressure of 135 psig, pulling tape through after each casting cycle. The chain loops down and back up again to pass through the shearer and miller at the top right, where gate—the projections on the cast scoops—is removed. In the upper background can be seen an electric pyrometer that maintains the molten zinc alloy at about 800° F. An enlargement of the die section is pictured at the left below. The molten metal is forced by 80-psig air pressure through a gooseneck valve from the rear into the dies. Directly below is a close-up of the 1-inch dies.





ized molten metal. Each unit has a master air control valve that stops the entire caster. Each also has a glass screen that covers the front of the die area. When raised, casting stops, although the rest of the unit continues operating, simply spacing along the tape.

Air for the die caster is filtered, then relubricated at a rate of ten to twelve drops per minute. This is sufficient for the entire machine but is not enough to cause oil spots on the tapes.

Joining and Finishing

Long lengths of chain are pulled through what appears to be a giant slider. Two sets of chain are locked together and bottom stops are added to each section. Fabricated of wire, the stops are passed over the bottom scoops, through the tape and are clinched around the back.

Lengths of joined chain, still not cut into individual zippers, are next "undercoated," a treatment for adhesion, and allowed to air dry for 15 minutes before they are enameled. Baking for 15 minutes—first at a low temperature to set the enamel, then at 300° F—follows. Undercoating, air drying, enameling and baking are done in a continuous operation, the long interlocked chain passing over and under series of rollers and through the various stations. Finally the chain is given a coating of wax for easy initial operation.

Enamel is purchased to match the tape colors. At all times the total Crown Fastener line consists of more than 100 colors, varying from season to season with white, black, red and navy being standard. With such a variety, in addition to the six sizes of zippers, the multitudes of slider styles, assemblies and lengths, several thousand different zippers are produced. Seasonal demands from the garment industry cause fluctuations in what is called the industrial line, however the over-all operation at Newport News is balanced by a steady production for the retail trade.

Packaging

The chain is finally cut into lengths that can technically be called zippers. The smallest produced is 4 inches long; the longest is seldom more than 36 inches in the die-cast variety. Of course an infinitely long one is entirely possible; practically speaking, the most popular sizes are 7 to 12 inches long.

The zippers are sent to the assembly department. There, girls sitting at long tables attach the sliders and affix the top stops. Each zipper is operated once or twice to make sure it is in good order before being sent to the packaging stations. Finally the slide fasteners are rolled, together with sewing instructions, and are inserted in round plastic containers.

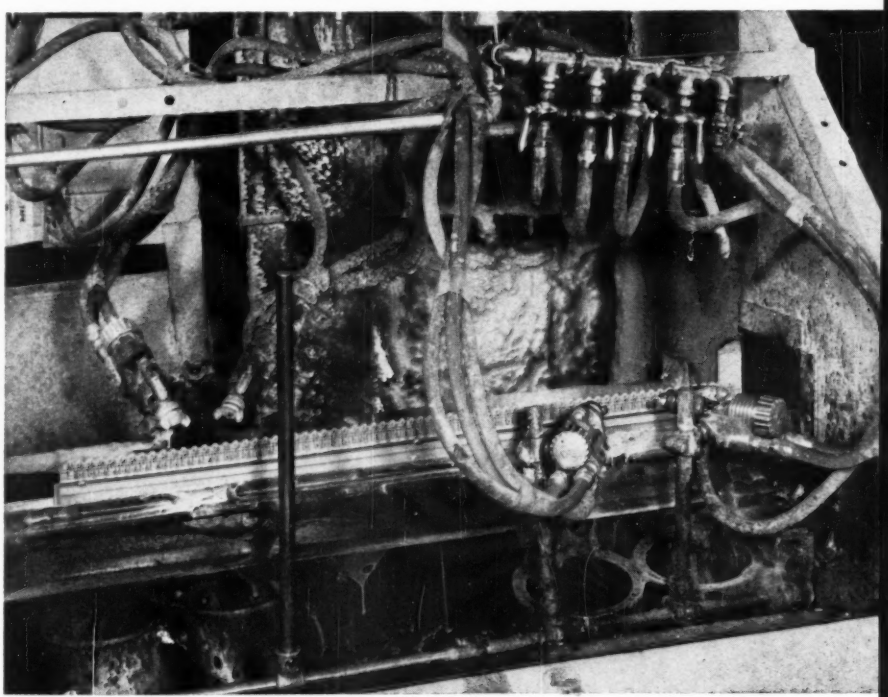
Zipper merchandising has come a long way from the door-to-door peddler of the early 1900's. At one time, cellophane bags were standard. Coats & Clark developed its plastic containers in 1954. They have meant for the retailers, excellent displays and easy reordering. For the ultimate consumer, selection is a pleasure. Racks, like those for canned goods in a supermarket, are furnished by Coats & Clark Sales Corporation. Zippers roll by gravity into selection position each time a container is removed from the bottom.

Labeling each plastic container causes something of a problem because of the variety of fasteners produced. Length, color, and type of zipper must be indicated. Production is necessarily on a small-lot basis, with new labels being printed on the spot after every few hundred fasteners have been packaged. The labels are partially precut in circular form and come on long strips of paper. The containers enter the labeling machine, one at a time. The tops and bottoms are given a coating of a plastic activator that turns the containers' surfaces into a "glue." Then the labels are attached at a rate of 300 per minute.

The containers pass single file to a packaging section. Six units are counted off, positioned in groups of three, and automatically pushed into paper boxes along with a reorder card. The boxes are closed mechanically and packaged in large fiberboard containers ready for shipment.

Industrial zippers are packaged without plastic boxes in 100-unit lots. Some zippers, especially those of the stamped variety, are shipped in long continuous

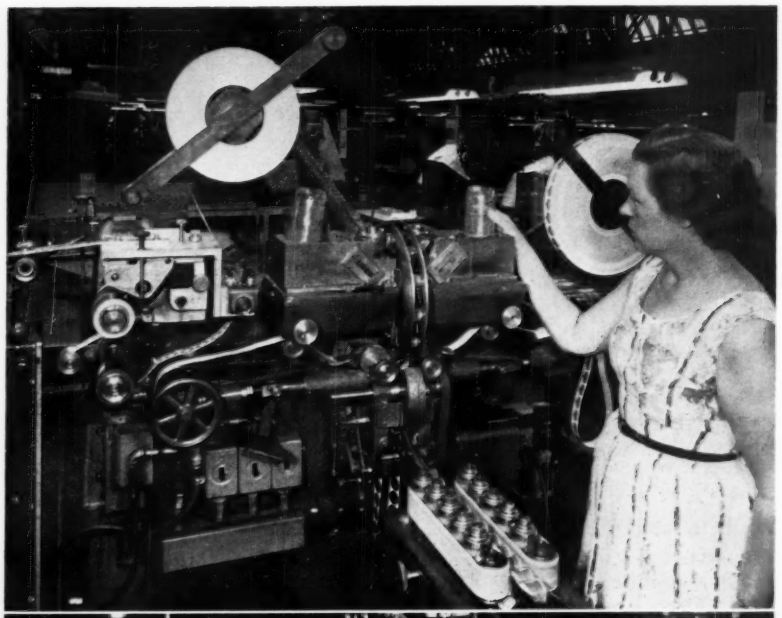
SLIDER ENAMELING **Sliders follow their own production line, which terminates with enameling (below). The sliders, attached to the long bar, have just been inverted and are being sprayed on top and bottom by two sets of spray guns. These operate at 10-psig air pressure. The bar continues to move to the right where it changes course perpendicularly to the spray booth and continues on two tracks through air drying and baking for final hardening. Sliders are sprayed to match zippers.**



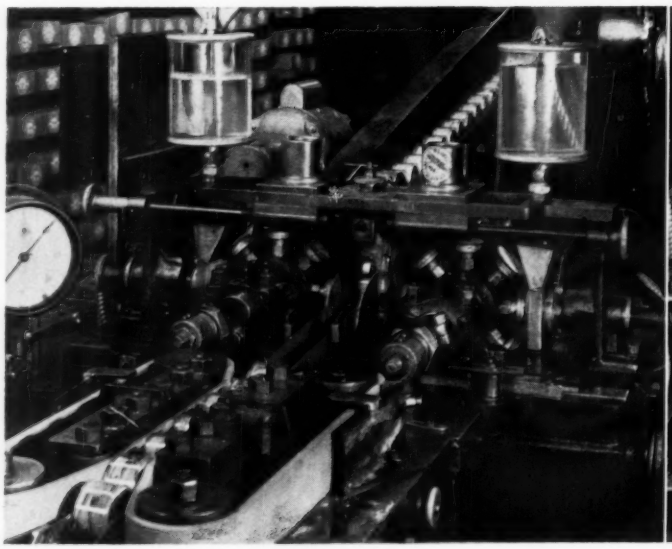
rolls of chain on large spools. These are sent principally to the industries which do their own assembly work.

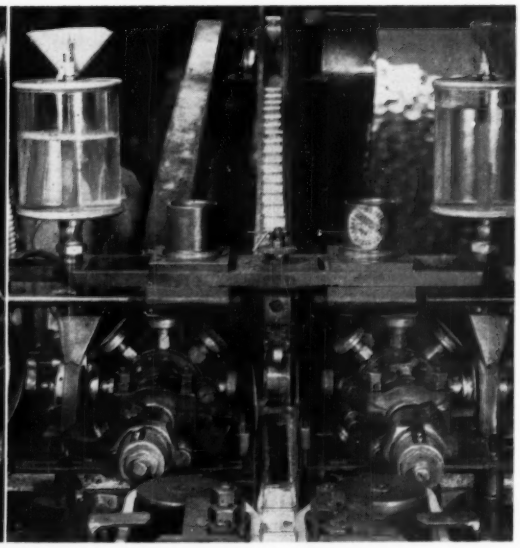
Quality Control

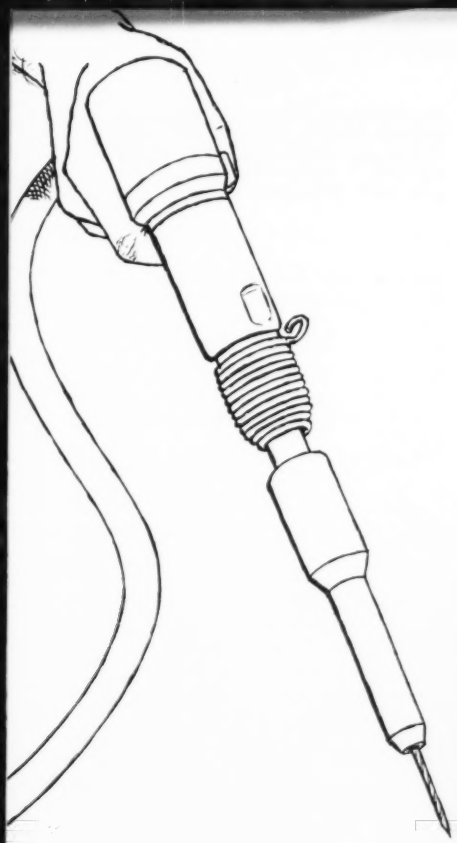
Inspection of each zipper at the assembly station is not the only means of checking quality. A complete control program is constantly in operation. Batteries of inspectors take random test samples at every stage of the manufacturing process and perform all manner of tests. They examine the top and bottom stops, the sliders, the fabric in all directions, and the individual scoops. Some completed zippers are even sewed into a serviceability testing device that simulates 10 years of use by running the slider back and forth 2000 times. Records are kept. If at any time defects are noted, the manufacturing operation is stopped and corrective action is taken, for tolerances are very small and control is rigid in Crown Fastener Division.



LABELING Small-sized zippers are labeled (right, top)—job-to-job. They enter from the rear and are fed by gravity down the track in the center background. Printed labels, rolled on large spools, are then applied without glue. The two bottles on the top of the labeling machine, one of which is being adjusted by the operator, contain a plastic-activating fluid. This turns the plastic tops and bottoms on the containers into an adhesive. The labels are given extra adhesion by the pressure rollers in the foreground. (Right is the infeed conveyor side.) At the left below is the labeling device for the larger-sized zippers. The labels are stacked just to the inside of the glue containers at the top of the machine. They are picked up by vacuum cups (close-up—below, right) on the rotating wheels and are swung around past the glue applicators. The plastic boxes move from the background to the foreground, receive their labels, and are then boxed, three to a paper container.







AIR

HELPS REBUILD THE BOARDWALK

G. R. Smith

LAYING DECK Each armed with Ingersoll-Rand Nail Drivers, these carpenters work three abreast. The rows of wedges maintain 1/4-inch spacing between deckings, wide enough for good drainage but sufficiently narrow to avoid ensnaring women's heels.

WHEN Emanuel Gottlieb handed in his bid for replacing part of the famed Atlantic City (N. J.) Boardwalk, he knew he was gambling. The risk bloomed from the audacious way he had figured his price. For some time the young contractor had observed the conventional local method of building the walk, and though he wasn't sure how, Gottlieb believed his company could do the work more efficiently. To estimate the Boardwalk job, he had first determined what it would cost him with conventional practices; then he bravely slashed this price by a certain percentage, turned in his bid, and waited. After he learned he was low bidder, he started the work and simultaneously began searching for cost-saving techniques. This was during the fall of 1959. Gottlieb's Neptune Contracting Company finished the contract on June 1 this year, in time for the Boardwalk's ninetieth birthday on June 26. As it turned out, the contractor's personal inventiveness, combined with air power's speed, meant the difference between success and a financial flop.

The Atlantic City Boardwalk is a 6-mile-long stretch following the shoreline between the city and the Atlantic Ocean. There are three standard widths encompassed in the total length: 21, 41 and 60 feet. Although gradual development of the structure (*see page 18*) has produced various styles of under-pinnings, the decking consists of a uniform herringbone pattern of 2x4's. This pattern is broken by two continuous 6-foot-wide paths of 2x3's laid end to end. These act as smooth runways for golf-cart-like roller cars that carry (at $2 per hour) persons who don't wish to walk. Between the foundation members and the decking are 4x14 and 6x14 joists. Pipe railings line the entire length of the esplanade—as it was once called—and pavilions occasionally project out toward the sea from the Boardwalk proper. These allow strollers to pause without interrupting traffic. Next to the climate, the Boardwalk is undisputedly the town's major attraction, and is worth far more than the timber, concrete and steel of which it is composed. Each year some 12 million persons saunter along the walk, chatting, viewing the ocean, and visiting the shops. Such traffic, along with corrosive marine air, means the Boardwalk must be replaced occasionally. The last time was in 1934.

The $700,000 contract that Gottlieb and his concern received called for replacing 7200 lineal feet, or about 25 percent of the total length, plus eight pavilions and the plaza before the city's famous Convention Hall. Some 825,000 board feet of Georgia pine decking and 800,000 board feet of fir joist were laid.

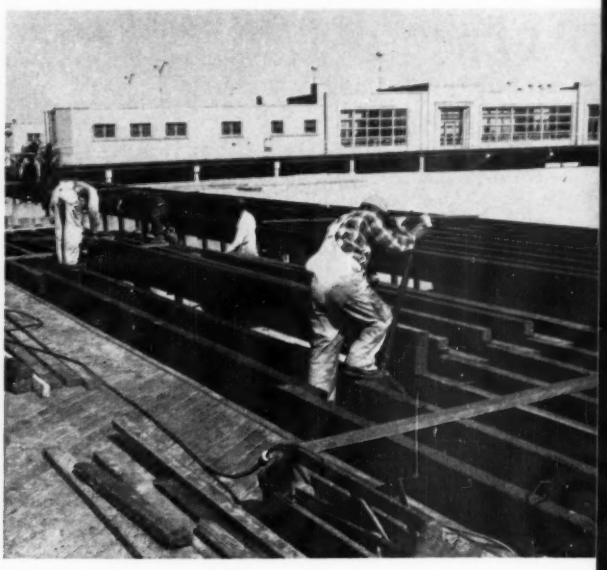
CONVENTION HALL Another contracting concern is using I-R Nail Drivers at Atlantic City for refurbishing walk in front of Convention Hall. The main hall seats 40,000 persons.

Neptune Contracting Company also had to rip out the old section of the Boardwalk to be replaced. It was here that Gottlieb's ingenuity first paid off. He had long ago studied the usual method for taking up decking: prying with a bar, a man would lift each successive old 2x4, while using the just-loosened board as a fulcrum. Often the newly-loosened board would break and the worker would have to look about to find a sound one to put in its place. A man tearing up decking this way had to stand on the ripped-up section, instead of the decking still intact. The footing was shaky and often the man would slip a foot through. The whole process was a safety hazard.

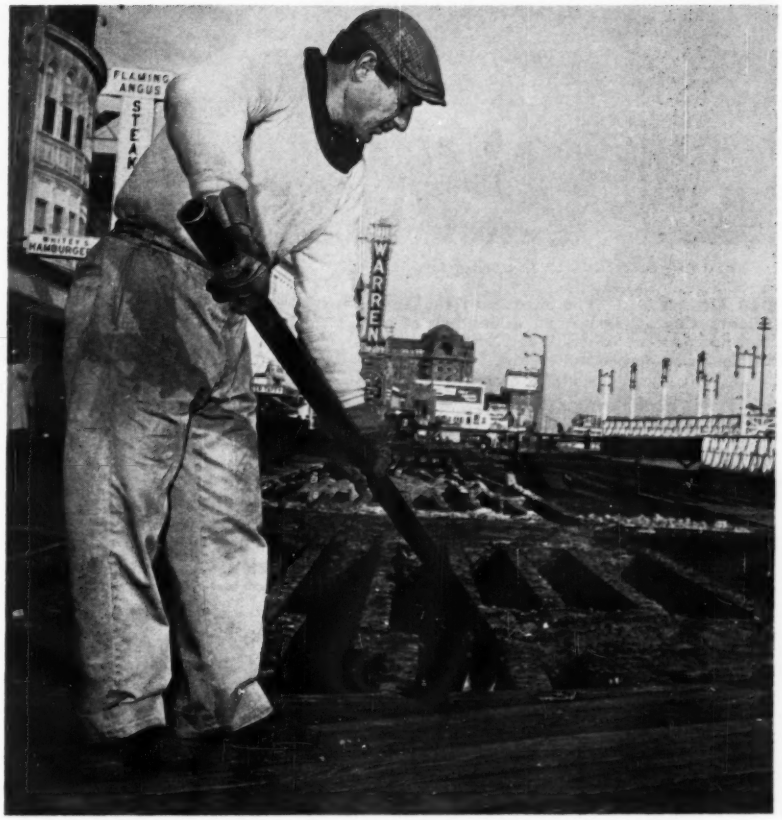
Two things were needed. First, a solid fulcrum for the bar to work against, and second, a substantial place for men to stand. After pondering the situation, Gottlieb devised a simple tubular bar that solved both problems. In operation, a flat hook at the working end is placed under the far side of the 2x4 or 2x3 to be raised. Farther up from the end is a metal member that projects down to rest on an unloosened board—the tool provides its own fulcrum on the solid decking. As the worker pushes down, up comes the board. An amazing amount of efficiency was gained with the bar for the four men assigned to this task did the work of twelve using the old method.

Gottlieb was $2\frac{1}{2}$-months into his 10-month contract before he located his second major cost-saving device. At the outset he realized the traditional method of pounding in nails with claw hammers would have to be discarded. He had 4,000,000 to drive. He decided on an air-operated hammer and set out to find the one best suited to his job. After a $2\frac{1}{2}$-month search and spending $500 in telephone calls, he selected Ingersoll-Rand Company's AVC-131 Nail Driver. This is a lightweight compressed-air-driven tool originally designed as a speedy, hand-held riveter. A nail set added to the business end transforms it into an efficient nail driver. An operator holds the unit by its offset grip, much as he would a pistol, and slips the nail set over the nail to be driven. He squeezes the trigger and the piston in the tool strikes the nail set which pounds in the nail in 1 or 2 seconds. According to Gottlieb one man with the tool drives as many nails as two men swinging ordinary claw hammers. The operators became so accustomed to the speedy, nearly effortless action that they disliked going

LEFT TO RIGHT: FIRST STEP IS RIPPING OUT OLD WALK TO DENUDE FOOTINGS. LEFT PICTURE SHOWS A PAVILION ON THE SEAWARD SIDE. NEXT, JOISTS ARE MANHANDLED ONTO FOOTINGS . . .



LIFTING PIPE Gottlieb's wreckers multiplied their efficiency threefold by wielding this tool. It provides its own fulcrum on solid decking. With the old method, a bar pries on loose deck.



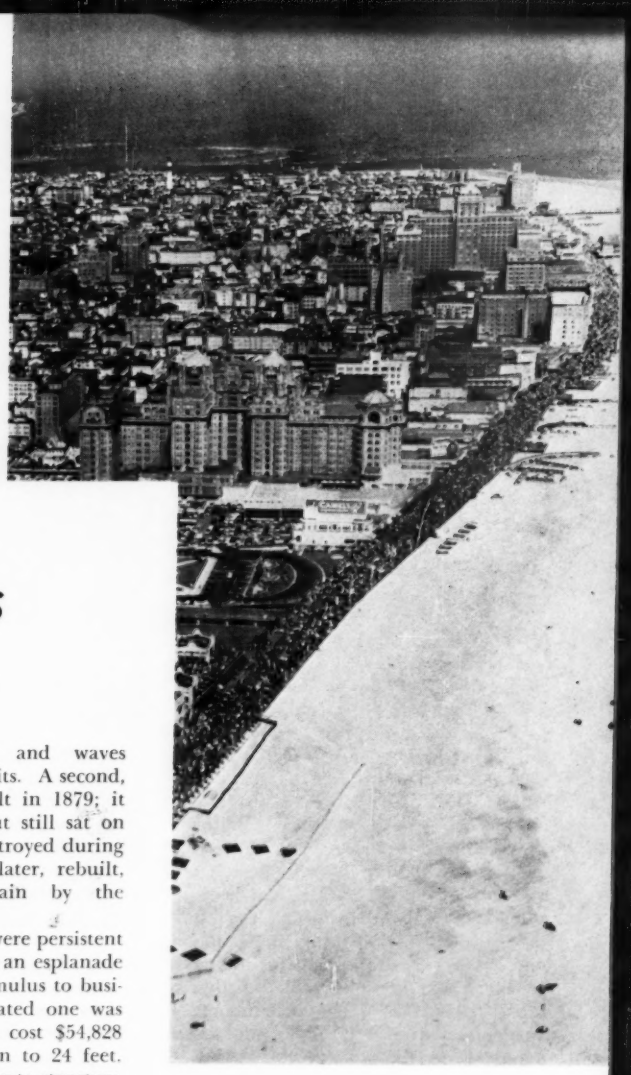
back to the hand-held hammer for incidental trim work. Four men worked full-time with the air-operated hammers for about 100 days and a fifth nail driver was held as a spare. Assuming that the tools replaced four men, the saving in the wages of four carpenters, at $35 a day each, for 100 days, was $14,000. The contractor pointed out, however, that this amount cannot be arbitrarily stated. As with any kind of manually operated tool, maintenance periods and other inefficient times occur when the tools are not working.

Laying decking of course was one of the final tasks. Earlier the heavy joists had been manhandled into place and given a coat of pentachlorophenol to combat the salt air. Strips of treated paper separated the joists from the decking. Workmen coated the decking with chromate of zinc chloride.

With the cost-saving methods in operation and the workers well trained, the work began to run smoothly after the first few months. Gottlieb then began to realize his "gamble" had become chiefly a problem in logistics. Each day three trailer loads of lumber had to be laid or the job fell behind schedule. He estimates that his men built boardwalk three times faster than Atlantic City residents had ever seen it put down before.

Despite its name, Neptune Contracting Company was new to decking and dock work. The 20-year-old concern has concentrated on commercial building construction—schools, fire houses, and factory structures. Its largest contract was a million-dollar motel recently erected at Atlantic City. The name instead springs from owner Gottlieb's affinity for the New Jersey coastal area where most of his work is gathered. On the weekends when his construction projects are quiet, sun-bronzed Gottlieb can usually be found plying the Atlantic Ocean in his boat or lolling at his seaside home near Atlantic City.

. . . AND ROLLER-CAR RUNWAY AND DIAGONAL DECKING ARE PUT DOWN. CAR RUNWAY GETS EXTRA SUPPORT. CARPENTER BRINGS NAILS TO THREE WITH AIR TOOLS. FINALLY, DECK EDGE IS NAILED.



OLD AND NEW The picture at right shows today's bustling Atlantic City, its Boardwalk a long belt of humanity. Above, the esplanade of 60 years ago. At the bottom of this page, vintage, man-pushed roller cars. Today's are battery driven.

Boardwalk Celebrates Its Ninetieth Birthday

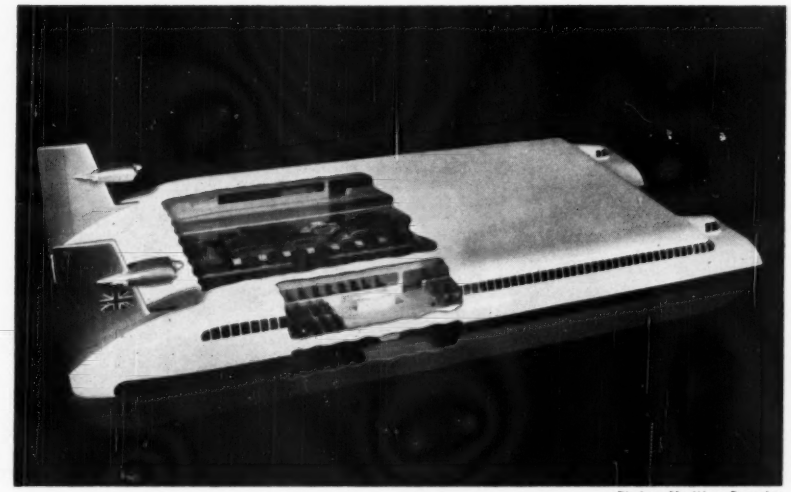
AS Jeremiah Leeds stepped ashore in 1788 on the island where Atlantic City now stands, he saw little to excite his imagination. True, he knew the weather was pleasant, for he had lived there for short periods before, but this time he had come to stay. Before him lay a desolate expanse of frog ponds, briar bushes, and barren, windswept hills.

Leeds, the first permanent resident, apparently did little to popularize the area during the years to come. A handful of early settlers earned their livelihood by hunting and fishing, and later there was a salt works. Occasionally a party from the mainland would stop by the beach. Then in 1845 the few natives were astounded when some casual visitors asked to stay overnight in Mrs. Millie Leed's cottage, the first Atlantic City "hotel." In 1854 a railroad line came into town and the city began to grow.

Jacob Keim, proprietor of a hotel named the Chester County House, and Alexander Boardman, a railroad conductor, conceived the idea of a boardwalk in 1870. The town's frontage was becoming popular for beach parties (5000 persons visited the resort that year), and gaily-colored dressing booths dotted the shore. Why not build a wooden esplanade to keep the vacationers' shoes out of the sand? The older townspeople fought the idea, but it finally passed and the small boardwalk was built. It was a crude affair, 8 feet wide, placed directly on the sand. In the winter it was taken up so the wind and waves wouldn't dash it to bits. A second, better walk was built in 1879; it was 16 feet wide but still sat on the sand. It was destroyed during the winter 4 years later, rebuilt, then destroyed again by the weather in 1889.

The townspeople were persistent in their wish to have an esplanade for it was a great stimulus to business. The first elevated one was put up in 1890. It cost $54,828 and width had grown to 24 feet. In 1896 a more elaborate structure of steel, iron and wood was authorized and part of this walk is still used today. Width had increased once more—to 41 feet—and the construction cost had skyrocketed accordingly to $143,986. In August 1896, the City Council officially adopted the name "Boardwalk." Extensions in both width and length continued, until a large portion was 60 feet wide and the length grew to 6 miles. During the period 1896 to 1950, about $1,875,000 was spent on new construction, and the total cost of the current refurbishing will go far beyond that.

The 12 million persons that annually visit Atlantic City, when not strolling the long Boardwalk, are either attending conventions or enjoying themselves at yacht and golf clubs, tennis courts or simply on the beach. Beside living at the 1200 hotels within the city, the vacationers stay at luxurious new multimillion dollar motels that have sprung up, setting a new trend.



Photos, Maritime Reporter

HOVERCRAFT CAR AND PASSENGER CROSS-CHANNEL FERRY MODEL

Down to The Sea On Films of Air

THERE is little compressed air cannot do. It has supplanted some of man's finest inventions. Ford Motor Company's Levacar (see *Compressed Air Magazine*, "Glideair," June 1958) is an outstanding example of air replacing the wheel. Now, Experimental S. R. N. 1, more commonly called the Hovercraft, is replacing the oar—or rather the paddle's more contemporary propulsion counterparts.

With the constantly recurring interest in Channel crossings, it was fitting that the Hovercraft's first trip was over the English Channel. When the journey had been completed, it was apparent that a revolutionary form of transportation was here.

According to an article in *Maritime Reporter* (March 1, 1960), the principle of achieving almost frictionless lift by means of compressed air is under serious consideration in a number of development-manufacturing organizations throughout the world. Two of these, Saunders-Roe and Curtiss-Wright, are working on craft with definite commercial objectives. Both are ready to open negotiations with any shipping companies in a position to collaborate on the development work.

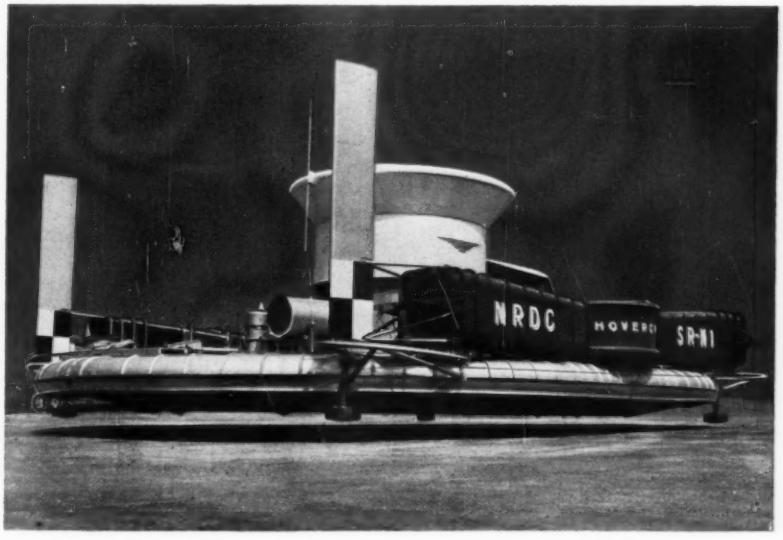
Each company's craft utilizes the air-cushion-under-the-bottom-surface-of-the-vessel principle. Security prevents discussion of the details of their operations, but it is known that the manner of achieving the air cushion is not the same. Here we are concerned with the Saunders-Roe craft only; the Curtiss-Wright model will be discussed in a later issue.

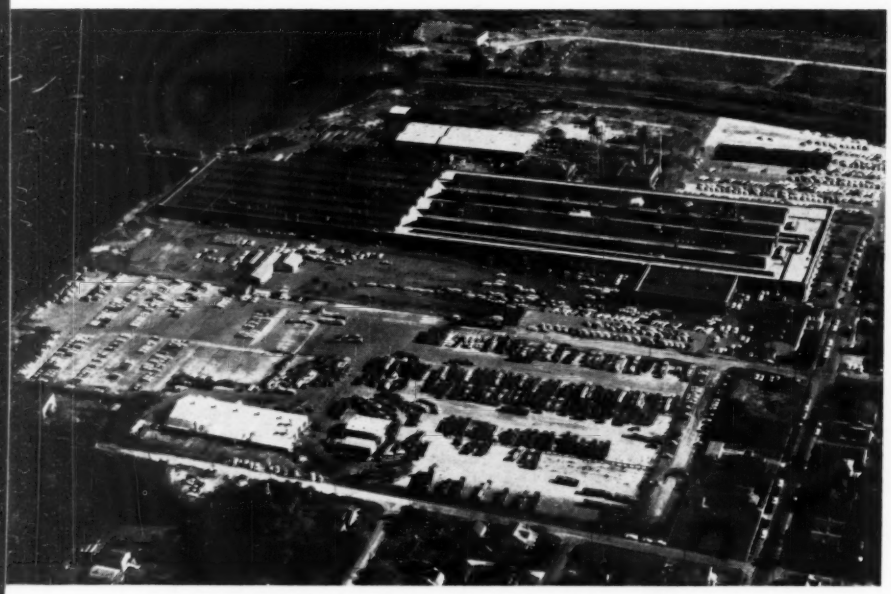
In the Experimental S. R. N. 1, the pneumatic cushion is contained within a curtain of air that flows from the craft to the ground. It is the force required to bend the curtain outwards that dictates the magnitude of the cushion pressure that can be built up and sustained. With the use of such an air curtain, great economies can be realized in the needed air for cushion pressure; air is prevented from dissipating from under the vessel, and any loss is replenished from the air curtain. It also makes the craft especially stable—a criticism often leveled at the land and rail air cars (see *Compressed Air Magazine*, "Giving Vehicles The Air," April 1960). As the Hovercraft drops, the air pressure in the cushion automatically increases; when the vessel rises, the subsequent decrease in pressure lowers the craft back.

Although designers of the S. R. N. 1 admit that it is clumsy and an uneconomical "laboratory" model, the air-lift principle gives it new design development potential. Such a new model is illustrated at the top of the page. It is a Saunders-Roe car and passenger cross-channel ferry. When built, it will be able to travel at about 90 knots, carrying 300 passengers. Weighing 100 tons and of 130-foot-length, it will travel between 1 and 4 feet above the surface of the water. The model shows an elimination of the air-inlet tower (as shown in the other photograph), substituting streamlined vents at the front to feed four air-lift engines. Although the experimental model used air propulsion, the future Hovercrafts will incorporate aero-type engines with propellers for forward propulsion. It is uneconomical to use air for any other purpose than support.

It is thought that the Hovercraft will be especially suitable for transportation in those areas of the world where port facilities are inadequate and over waterways that are choked with vegetation or dry, for the air support is equally effective on land as it is over water. Likewise, it also has great potential over swamps, deserts and marshes.

EXPERIMENTAL S. R. N. 1 HAS CROSSED THE ENGLISH CHANNEL





1959 WINNER This plant on the banks of the Elizabeth River, Norfolk, Va., proudly flies the gold quality award pennant. No manufacturing is done here; all components are shipped in from the outside for assembly. Coming off the line are all types of vehicles.

QUALITY

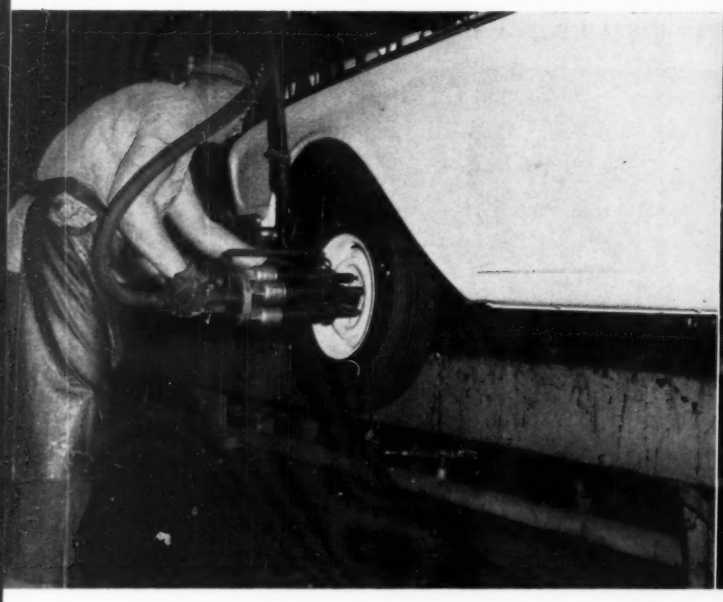
its achievement and CONTROL

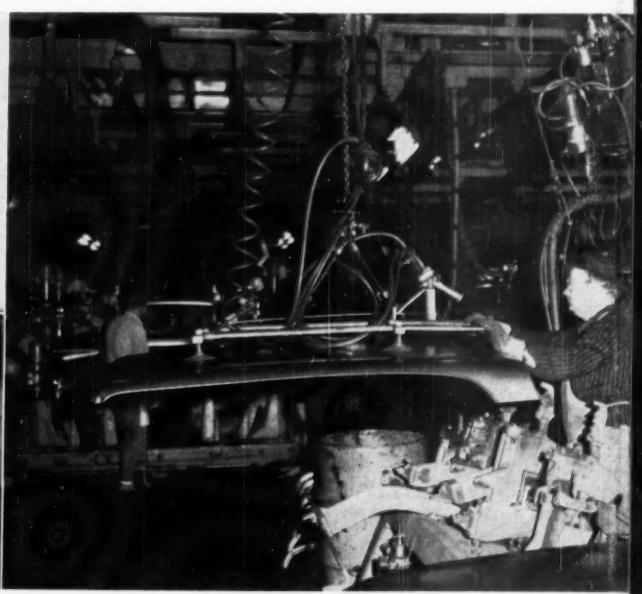
at Ford Motor Company

Peter Sleight

THERE is satisfaction in quality. A quality product builds good customer-salesman relationships; it promotes dealer-production co-operation; it brings esprit de corps to production plant employees. Last August there was celebration at Ford Motor Company's assembly plant in Norfolk, Va. The employees had won the company's Production Year Quality Award for the 1959 models. It was the first year the company had put the award system into operation, and the results were beyond all preconceptions.

The quality award was based on 6 months of production, and thirteen of the company's assembly plants, scattered throughout the United States, competed





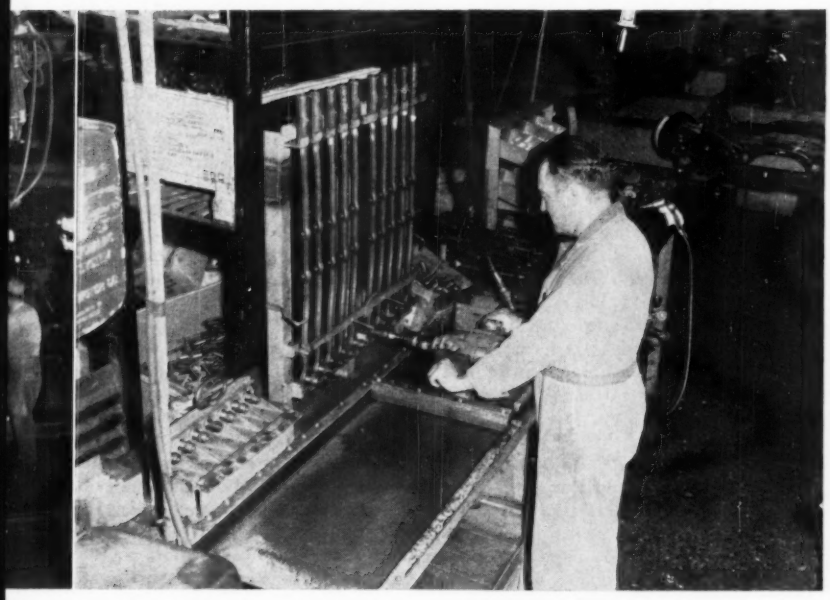
for it. The 6-month basis was selected since time is lost from a calendar year for model change-over. It also permitted each plant to weed out initial bugs that are common to any assembly line. In this way, all the competing facilities were off on equal footing.

It is not easy to tool up for mass production of a new automobile model. The problem is uniquely complicated at Norfolk for many breeds of vehicles pass down the line—bus chassis, trucks and all models of Ford cars. First, intricate and precision tooling had to be devised. Then there was to be no compromise in production quality if the award were to be won. The men of all departments in the plant, the tools and techniques of assembly they used, and the will to win: these were the ingredients that made the prize a reality.

How does a plant cope with such a program? Management at Norfolk worked on many facets. Training in over-all assembly techniques and in detailed tool operation was one phase. Too, constant checks were made of tooling set-ups to be sure that each piece of equipment was being used for its specified job or jobs and was being treated properly. Every attempt was made to assign the right tools to the right tasks. Compressed air, recognized in the automotive industry as efficient economical power, and torque control, with assured consistancy of results, also played their parts. Even the make-up of the quality control system itself had an inherent helping hand.

The audit program was devised by Ford Motor Company's home office in Detroit, Mich. It is based on an accumulation of demerits and points. A perfect car rates 10 points; faults found in inspection detract from this. Of all the plants co-operating in the 1959 challenge, only one—Norfolk—turned out a 10-point car. The system is strict.

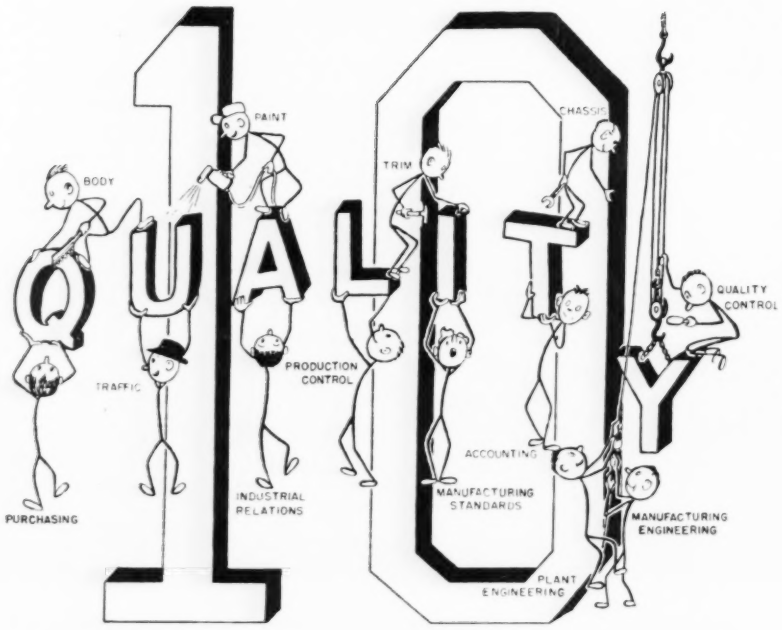
Special inspection teams audit the completed vehicles, all of which have previously passed the usual Ford testing and have been marked ready for shipment to dealers. The inspectors act as customers—albeit highly trained custo-



MANY OUT OF ONE Five nuts are run (far left) at once with this multiple runner made of single-drive Ingersoll-Rand air motors on a common mounting plate and manifold. The result is rapid production with critical tolerances. The swivel-type suspension allows for changes in wheel position.

VACUUM LIFTING This Ingersoll-Rand vacuum lift hoist (center) was pioneered at Ford's Norfolk plant. It holds car roofs rigidly in place during handling in what was once a 2-man job. Both the hoist and the vacuum operate from plant air supply lines. This particular hoist has a 200-pound rated capacity. It is estimated that it cycles 135,000 times annually on passenger car assemblies, yet never drops the panels.

JIGS AND PNEUMATICS Bushings on steering idler arm assemblies are run quickly and efficiently, to constant torques of 150–200 foot-pounds with the simple jig attachment (left). The operator just follows the Ingersoll-Rand stall-type air motor in as it runs the fittings, withdraws the tool and socket, sliding it to the next position.



A RARITY During the 1959 production year, the only 10-point car that was produced in all of the thirteen competing plants was at Norfolk. A member of Norfolk's accounting department, A. C. Smith, visualizes a 10-point car in this way, with each department co-operating in an esprit de corps.

mers—and record their findings as a buyer might report to a dealer, though far more thoroughly. At least twenty cars and trucks are selected at random for the audit each day. The audits are made and tallied for each shift. These tabulations show the frequency of defects. This information is passed to a plant management team called the Quality Committee. There is one committee at each of the thirteen plants, and each is responsible to Milo M. Dean, manager of Quality Control in Detroit. Each consists of the plant manager, a quality control manager, and the production manager.

The committee reviews the faults listed on the audit tallies and confers with production supervisors. So carefully are the audits made and checked, defects can be traced not only to the department responsible, but to the shift, the supervisor and the man on the line. Corrective action can be taken quickly when the defect frequency rate rises.

To correct the faults, tooling must be changed in some cases; in others, reemphasis on the value of craftsmanship is enough. Ford believes that quality is men—men working with tools.

Each audit covers about 1500 items listed on standard forms for the auditors. These areas of inspection are divided into five classifications: (1) Body Visual and (2) Water Test, which make up the Body Audit; and (3) Chassis Visual, (4) Measurement, and (5) Drive, which constitute the Chassis Audit. For example, under Body Visual, an inspector will check for defects in body finish, solder joints, door closure, deck-lid tension and fit. In the Drive classification, the vehicle is road tested on a special course that simulates actual driving conditions. Brake effectiveness, body tightness, steering ease, and the like are all checked.

Perhaps one of the most comprehensive sections to audit is Measurement. Everything is graded from the action of window handles to the torque on wheel bolts. Of major importance behind this classification are the air tools along the assembly line. In order not to receive excessive demerits, a close watch is kept on the pneumatic equipment. Those tools that operate with torque control devices receive regular gauging on a continual department-to-department rotating basis.

Torque, which varies considerably from job to job along the lines, is important at Norfolk. The proper audit-limit tension required for each assembly is determined and the tools required on the job are set to a corresponding torque. These may vary from inch-pounds in door and window regulators to nearly 500 foot-pounds on rear wheel nuts of trucks. Such tools, whether they be large nut runners or small screwdrivers, will consistently produce the right amount of tension in a nut and bolt or screw—no more and no less—once they have been set. This is of prime consideration in mass production at Ford, for not only must the tension be accurate, but production rates must be maintained. Torque control permits both.

Some tools along the line are standard; others are designed by the tool sales engineers for specific applications; still others are Ford creations. By far the majority of tools are used singly. In some instances, however, single tools are grouped together on a common mounting plate and manifold; other cases show one tool operating in conjunction with a jig to do repetitive operations quickly, though accurately.

Since all breeds of cars and trucks pass down the line, each with its own specifications, a variety of tools must be at each operator's station. These hang overhead on balancers and can be conveniently pulled down for operation as needed. For example, on Ford Model F-100 and F-250 trucks, a torque of 67–75 foot-pounds is required for the front wheel assembly. An Ingersoll-Rand 5081T torque-controlled Impactool is used. When a Ford Model F-350 truck passes the same station, a 5340T is available with a setting of 175–200 foot-pound torque for front wheel assembly.

An example of a single tool working in combination with jigs is found in the installation of bushings on steering idler arm assemblies. Ten tie rods are vertically aligned and clamped in an upright frame. In front of these is a guide in which a jig rides. The jig clamps over the handles of an Ingersoll-Rand stall-type air motor, Size 3SM. It not only holds the tool at the proper elevation and angle to tighten each of the aligned fittings, but eliminates all torque reaction to the operator as well. Moving and positioning the tool is easy and consistent.

Air pressure is adjusted to produce the 150- to 200-foot-pound torque specified on the audit sheets for this application. The operator places the tool's socket over the first fitting in the frame and runs up the fastener, following the tool as it is pulled toward the workpiece. At the predetermined torque, the tool stalls. The operator then slides it back from the fitting and laterally moves both jig and tool along the guide to the next fitting. The cycle is repeated. Ten critical assemblies with an assured quality connection are produced every minute.

Throughout the motor dress-up line, which is separate from the other production lines, numerous Impactools, operating individually and without jigs, can be seen. Many are Ingersoll-Rand Sizes 508, 5080, 5081 and 808 Impactools. Since the line moves rapidly and each engine has a variety of nut-running applications, these tools prove ideal. They are light in weight and are easily moved from job to job, or along the line as the engines swing toward the chassis and frame components. They operate on standard 90-psig-pressure shop air.

Not to be forgotten are the smaller

workhorses of automobile assembly—the screwdrivers. About 90 percent of the screwdrivers at Norfolk are equipped with Cushion Clutches. These give them the same ability to run fasteners to specified tightnesses as torsion-bars do in the larger torque-controlled Impactools.

Like its larger relations, the screwdriver can also be used in conjunction with other pneumatic tools. In an interesting application on the body, it is coupled with an air-powered riveter. Each of the tools is attached to a length of $^3/_8$-inch hose, which is in turn connected with a wye fitting to the main air hose. Using an Ingersoll-Rand AVA 12 Riveter, the operator pierces a screw hole in the metal rocker panel of the car. Metal from the hole is extruded downward leaving a smooth upper surface and a long, self-threading section on the reverse side. This gives the self-tapping screws, which are next run, a longer threading area than would normally be possible. It is such attention to detail that brings quality to Norfolk's assemblies.

Any defect noticed in torquing, as well as in any of the other four classifications of audit, is given a demerit. These are scaled from 0.2 to 20, depending on the seriousness of the fault. At the bottom of the demerit scale are the Incidental Defects. These are failures to meet standards which have no functional application on the car. An example might be a slight scratch on the body paint in an obscure area.

Two demerits are given for Minor Defects—those that require preventive maintenance. Ten demerits are "awarded" for both Major Defects and Safety Defects. The former would create non-operating conditions or the failure of a major automotive component. The latter, as the name implies, could cause bodily harm to the driver. At the top of the scale are the dread Safety Critical Defects. These receive 20 demerits and are given for faults that could cause immediate failure of a vehicle and might result in bodily harm.

In May, the initial month of the audit, Atlanta (Ga.) and Norfolk assembly plants tied for first place. Chester, Pa., and San Jose, Calif., were second and third, respectively. Norfolk was awarded a plaque and a gold flag that it could keep for 1 month, unless of course it came in first again in June. It did, and held the plaque for the second month in succession. Chester once more placed second and Dallas, Tex., came in third.

And with the quality control, production was running high. At Norfolk, 7685 units were turned out in June (bringing the yearly total to 47,712 cars and trucks). This was better than double the figure for the preceding June. The audit was bringing custom-built quality to mass production without hindering it.

One more month was required if the award was to be held permanently by the men at Norfolk. Again in August the gold flag continued to fly above the plant. July quality had brought first place. The men had earned the right to retain the plaque. It now hangs proudly in the reception office, and reads:

PRESENTED TO THE NORFOLK ASSEMBLY PLANT IN RECOGNITION OF HIGHEST QUALITY PERFORMANCE AMONG ALL FORD DIVISION ASSEMBLY PLANTS FOR THE 1959 MODEL . . . FORD MOTOR COMPANY

RAIN AND WINDOWS As a part of the Body Audit, many items are inspected. At top an auditor is checking a window lever; at right, the entire body is checked for water leaks in this simulated rainfall at the Norfolk plant.

This and That

Balloons In The Stomach

X-rays, the time-honored means for diagnosing cancer may be giving way to pneumatics—at least in cases of stomach cancer. University of Minnesota researchers have reported favorable results of a new technique that has been tested on nearly 60 patients. The patient is first given a small amount of phosphorous-32, a radioactive substance that is absorbed in greater quantity by malignant tissue than by healthy tissue. Then a balloon, coated on the inside with photographic emulsion, is placed in the patient's stomach. On the end of the balloon is a tube, through which the balloon is inflated until it contacts the stomach wall. Where the balloon touches cancerous tissue, the emulsion is exposed by the absorbed radioactive phosphorous isotopes. After 6 hours, the balloon is removed and the picture is developed. Dark spots on the picture indicate cancerous tissue. Eastman Kodak Company thinks highly of the diagnosis system and is beginning to market the photo-balloons. From the first reports it would appear that the inflated balloon technique will permit earlier diagnosis of cancer than is possible with X-rays—in time for effective treatment.

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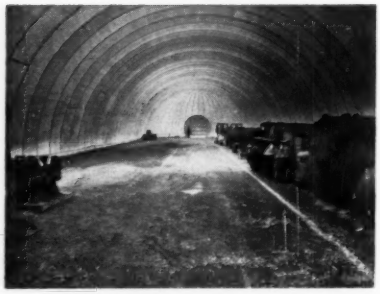
"Airborne" Marines At Oak Ridge

Another in the varied population of air-supported buildings is located at the AEC's Oak Ridge, Tenn., facility on a construction site occupied by the J. A. Jones Company, Nashville. The structure is a half-balloon that measures 50x250 feet and has an internal capacity of 460,000 cubic feet. Its nylon panels are 4 feet wide and coated on both sides with vinyl plastic, then joined by an electronic sewing machine. The lower section is fastened to a frame fashioned from 500 feet of 2-inch diameter galvanized pipe that molds the building's shape. The pipe is anchored to the ground. A 6-hp motor drives a 2-stage fan at 1140 rpm to inflate the big bag in about half an hour. Persons enter through four pedestrian doors whereas trucks pass through a 25-foot-long interlock tunnel. The strength of the "balloon's" roof was dramatically shown by supporting without rip or serious sag four Marines in full pack. Tests show the building can withstand a 70-mph wind with safety; should storm warnings indicate worse conditions, the structure can be quickly flattened by releasing the enclosed air. While the giant bubble is an innovation in local construction facilities, the idea is not new to many seasoned civilian engineers on the resident staff of the Atomic Energy Commission. They were with the Corps of Engineers during the Alcan Highway construction push to Fairbanks, Alaska. This project saw much use of air-supported buildings because of the constant changing of worksites.



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Art In A Can

Since 1935, when Dr. Charles A. Goetz brought the pressure-packaged "bomb" out of its laboratory curiosity stage, the cans have become mighty familiar objects to us all—barbecue fire lighters and moth murderers alike. Now it is the turn for the artists. Teamed with a Wren air brush and called Wren-Pak, the unit consists of a pressurized can that will operate for 30 minutes of intermittent spraying. A single hose connects the can to the brush; hook-up and change-over are simple and easy, according to the developer, Binks Manufacturing Company, Chicago, Ill. The brush carries its own material or paint supply in an attached bottle. With the spray pattern adjustable from round to fan, and all the intermediate patterns, and with a reported directional accuracy that will eliminate the need for masking in most painting operations, the Wren-Pak is not only handy for photographers and artists, but for general painters as well—may we suggest automobile touch-up work?

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New Light On Concrete Construction

Progress in reinforced concrete construction has been spectacular since World War II with the introduction of prestressing, of large thin-shell roofs, of mass prefabrication, and many refinements in design methods. Recent advances in steelmaking have made it possible to produce stronger steel reinforcing bars without substantial difference in price. Vital information on the behavior of structures utilizing such bars—almost twice the strength of conventional ones—has been compiled by what is reputed to be the most modern civil engineering research laboratory in the U. S. Under the direction of George Winter, world-recognized authority in the use of light-gauge steel in construction, research is being conducted at Cornell University to make possible the successful utilization of these high-strength reinforcing steels in buildings and bridges. The work has developed information on the behavior of structures incorporating these bars, and refinements of design methods ensuring safety and serviceability. The Cornell researchers have shown what measures must be taken to limit short-time and long-time deflections of such structures to acceptable values, to keep width of hairline cracks within safe and tolerable bounds, and what methods must be used to calculate the strength of such structures.

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The Right To Carve Totem Poles

If you were a Kwakiutl or a Haidas, by tradition you would have the authority to carve totem poles. These two tribes of the Pacific Northwest have jealously guarded this heritage for centuries. Ellen Neel, of White Rock, B. C., is one of Canada's oldest practitioners of the Indian art, and rightly so, for she is a direct descendant of a celebrated Kwakiutl chief named Klakwagila. She has been selected to carve a representation of the Thunderbird legend on a huge cedar log that has been erected at Stratford, Ont., for the annual festival. When completed, the 5-ton log will include five figures and will have a 20-inch finished diameter. Throughout the

festival, Ellen Neel will be doing the designing detail work and painting; her husband will do the heavy chopping and supervise the mechanics of the operation. When the pole is finished, it will be shipped to Ann Arbor, Mich., for it has been commissioned by a fraternal organization connected with the University of Michigan. While it is being worked on though, visitors may act as sidewalk superintendents for the pole will serve as the center-piece of a display of Indian arts, crafts and historical treasures arranged for the Stratford Festival through the co-operation of the National Museum.

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Wink And Blink

Electromechanical goggles with eye-protecting light shutters that can close twenty times faster than the eye can blink have been developed to protect wearer's eyes from burns or flashblindness from high-intensity flashes. They are equipped with alternate opaque vertical bars and transparent strips over each eye piece. These high-speed light shutters are operated by an electronic device activated by a light-sensitive photodetector. During normal use the plates are positioned so that the bars of each plate are superimposed on those of the other plate, and the wearer sees through the transparent slots. When a high-intensity flash is detected, the amplified signal triggers a device that moves each pair of plates over the slots in the other pair, shutting out the light. The tiny closing mechanism can flick the shutters into position in less than 500 microseconds. Light transmission through the closed shutters is less than 0.01 percent.

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Another Ship For A Mutiny

April 28, 1789—Captain Bligh and eighteen crew members of *H.M.S. Bounty* were set adrift on a 4000-mile journey to Batavia. Meanwhile, the mutineers returned to Tahiti and eventually settled Pitcairn Island in what has become a classic sea tale. Smith and Rhuland, a shipbuilding firm, recently received a contract to build another *Bounty*. This one is to be used in filming the second version of *Mutiny on the Bounty*. The sailing ship will be 118 feet long and will be made of American oak and Douglas fir. The beam will be 30 feet and the draft, 14 feet. Unlike the 3-masted original, the new ship will be powered by two 300-hp diesels and will be equipped with modern navigational aids, including power-generating equipment, radar, an echo sounder and an intercommunications system. Her new skipper will not have an opportunity to become the second "Breadfruit Bligh," as the first was called, for there will be deep freezers aboard for the convenience of the 25-man crew. When outfitted, the *Bounty* will sail directly from Nova Scotia to the south seas.

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Pneumatic Automobile Safety

Equipment that ejects airplane pilots in emergencies may have inspired Constantine George Papacosta in his obtaining of patent 2,929,637. The apparatus he has devised lifts automobile passengers out of the direct line of impact in a collision and whirls them around, still on their seats. The operator must press a pedal when he sees a collision is imminent. This pushes the front bumper forward. When the obtacle is struck, the bumper is pressed back. Compressed air, operating on a piston, raises the roof, windows and front and back seats, expending much of the collision energy harmlessly. The equipment also revolves the seats in a clockwise direction. In extricating himself from the wheel, the driver presses a pin and moves the hinged steering column out of the way.

★ ★ ★

Cooling Driving Comfort

"Hot, by jingo, in anyone's lingo" says the *Farmer's Almanac*, but no driver needs the *Almanac* to tell him the summer's heat is on. As the temperature rises, so do tempers—especially those of drivers who are not blessed with air conditioned automobiles. But these unfortunates may also find relief in a seat made of puffed Saran with a leatherette backing. For less than $30, any car can be equipped with the device. It is simply

plugged into a cigar lighter outlet, and a powerful blower inside an intake cylinder continuously sucks in fresh air, circulating it throughout the interior of the seat bottom and back under mild pressure. Breezes escape through the woven covering, evaporating perspiration to keep the driver cool. As for battery drain, reports indicate that it is less than that of a single headlamp.

★ ★ ★

Oldtimer For The Space Age

During the First World War, when lighter-than-air craft were more familiar than they are now, the exploration of space was but a gleam in fiction writers' eyes. We doubt if anyone thought of these two craft at the same time. Today, one of the perplexing problems of outer space—the transportation of 8-story-high rocket boosters from factories to launching pads —may be solved with the lighter-than-air craft. Analysis of the problem at Goodyear Aircraft Corporation indicates that a modern airship could land practically at the door of a rocket booster factory, clasp a giant 40-ton booster beneath its huge envelope, and deliver it to a launching site anywhere in the United States or, if required, to an overseas base. The reasoning is fourfold: (1) airships operate in the freedom of the skies, independent of tunnels, trestles, waterways and highway clearances; (2) because they derive lifting power from bouyancy in addition to the dynamics of flight, they operate into and from fields too small for transport airplanes, and can make point-to-point deliveries, eliminating all use of tractor-trailers, ships or barges; (3) their smooth, effortless operation eliminates possibilities of damage to sensitive components; and (4) they can operate over extended distances. GAC officials indicate that only the cabin structure must be modified and a cargo suspension system be added to convert the current ZPG-3W airship now in U. S. Navy service into a booster carrier. The ZPG-3W, with an envelope capacity of 1,500,000 cubic feet, can transport boosters 25 feet in diameter, 80 feet long and nearly 30,000 pounds in weight—which should meet booster sizes contemplated for the near future. Larger airships are feasible with correspondingly larger payloads.

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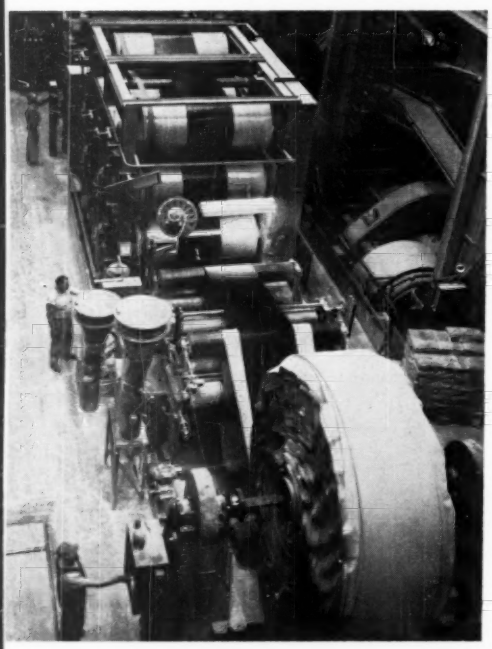
The Eyes Have It

Spinning out 2 to 3 miles of high-quality belting every day is the seemingly incongruous job of America's first high-speed automated belt calendering device. The 2-story machine has been installed at Goodyear's Plant II, Akron, Ohio. Designed for a maximum belt width of 72 inches, maximum roll diameter of 156 inches and maximum weight of 20 tons, the unit utilizes "X-ray eyes" to improve

uniformity and quality. One X-ray device senses the gauge of incoming components and reports thicknesses to a complex electronic panel. After the belt



passes through the calender, a second X-ray gauge measures and reports the finished thicknesses. The belt then moves through a giant 12-roll cooling line and is wound into a coil, ready for curing. An indication of the size of the unit can be seen in the photograph.

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Sentinels Of Safety Trophies

Six mines and quarries have taken top honors in the thirty-fifth National Safety Competition sponsored by the Bureau of Mines. The winners, achieving the best safety records in their respective groups during 1959 were selected from 672 competing mineral operations—the second largest number in the contest's history. For the first time since 1952, all the winners were free of disabling injuries. The injury-frequency rate reached a new low of 18.29 disabling work injuries for every million man-hours of exposure. The following winners will receive bronze Sentinels of Safety trophies and green-and-white safety flags provided by *The Explosives Engineer* magazine. The Bureau of Mines will give each employee a "Certificate of Accomplishment." Port Inland Quarry, Inland Lime & Stone Company received its fourth trophy in the Quarries Group. Wauseca Mine, Hanna Mining Company was first in the Metal Mines Group. Rouchleau Mine, Oliver Iron Mining Division of United States Steel Corporation, in its second competition year, was awarded the prize in the Open-Pit Mines Group. Akron Mine, Bestwall Gypsum Company; Stockton Mine, Jeddo-Highland Coal Company; and Harwick Mine, Duquesne Light Company were the winners in Nonmetallic Mines, Anthracite Mines, and Bituminous-Coal Mines, respectively —all underground groups.

★ ★ ★

. . . But Don't Go Near The Water

Atomic submariners at New London, Conn., may not hang their clothes on a hickory limb, but they will learn how to control their undersea craft while seated high and dry. Republic Aviation Corporation is constructing a land-based trainer for the purpose and it should be ready for operation late this year. The kitchen-sized trainer, being built under a $160,000 contract, can artificially but realistically recreate underwater sailing conditions from the familiar roll and pitch motions to steep dives and high-speed turns. The entire cab is mounted on a set of gimbals, and a transistorized analog computer works as the "brain" to cause the cab to react to the operator's direction. The unit has two control "sticks" and an instructor's station. A specially designed scoring panel automatically records the trainee's speed of reaction of an ordered maneuver, including reactions to any equipment-failure "emergencies" the instructor might signal. The submarine control is comparable to instrument flying in an airplane. In each case there are no visible clues as to how things are going other than those on the cockpit control panel instruments.

Compressed Air Oddities

Some years ago a semiprofessional baseball team in Wisconsin installed equipment for dusting off home plate with a jet of compressed air. When cleaning became necessary, the plate umpire lifted a cover that was even with the ground surface, raised the jet into position and stepped on a valve to turn on the air.

The American League recently considered adopting something of the sort, but the League's umpires unexpectedly opposed the idea. Charlie Berry, dean of the arbiters, stated that the men in blue preferred to retain the traditional whisk broom method. He explained that when players protested a decision at the plate, it helped to ease the pent-up feelings by whipping out the little broom and stooping to put it to use. He doubted that the mechanical gadget could exert the same calming influence.

Inflatable pillows and beds enjoyed some popularity in the 1880's. Pillows and mattresses of the first Pullman sleeping cars were inflated at night, then deflated for daytime storage.

In July 1907, it was reported in this magazine that a Doctor Marage, a Paris ear specialist, had invented an air-operated device that simulated the sounds of the human voice and that it was going to be adopted by a lighthouse on the French coast to shout warnings to ships at sea.

"Teeth, lips and jawbones are all imitated exactly," it was stated. "Small models, not appreciably larger than the normal human originals, can be made to utter a faint whisper or an ear-splitting yell such as no man ever made. With a mouth 6 feet from corner to corner, it is estimated that the artificial voice could be understood from 3 to 6 miles away, depending upon weather conditions. Mouths of this size are to be placed beneath the lens of the new French lighthouse."

This pneumatic voice was apparently not a howling success as it was dropped in favor of less spectacular but just as effective whistles, bells, etc.

A "pneumatic safety jail" was being promoted in 1899 by Pneumatic Safety Vault & Jail Company, Chattanooga, Tenn., but wasn't a commercial success. The jail cells were constructed of hollow bars, through which compressed air at 15-20-psig pressure was circulated. Floor and ceiling were made up of 2-ply steel plates with an intermediate air space. A Yale lock on each door was protected by a tube carrying compressed air and so located that it would have to be removed to get at the lock.

If any bar were sawed through or broken, or any plate were dislodged, air would escape and the reduction in pressure would cause the sounding of an alarm that would summon the jailer.

As a further precaution, each hollow bar had a core of hard steel rod that was free to turn and thus almost impossible to saw through.

EDITORIAL

Railroading

Compressed air is doing quite a job on the railroads. In many respects, it does the same type of work that it does for manufacturing and construction companies. It speeds the repair of equipment, cutting down time to a minimum and assuring that expensive rolling stock is not tied up. It pushes, pulls, blows, inflates and hammers to cut labor costs and increase productivity. It works to help an industry that is, perhaps, more strikingly affected than any other by the rising costs of labor without compensating productivity boosts, and by increasing costs of supplies it must buy.

RAILROADS today are afflicted with a variety of problems, some of which are unique to the industry. It seems to many that even the problems shared with other industries are intensified on the 'roads. For example, $0.58 of every revenue dollar is paid out in wages; the average for manufacturing industries is $0.265. Productivity thus looms much larger for railroads.

Railway wages are up 173 percent since the close of World War II; supply costs have more than doubled. Yet, ton-mile charges have increased only 52 percent; passenger-mile charges, 57 percent. This is a problem hardly unique to railroads. Conversely, however, the number of ton- and passenger-miles has fallen off appreciably. Thus, the base over which increased costs must be spread is smaller, rather than larger, as is the case with many other fields.

Railway employment is off 600,000. Fewer trains are in service, less miles of track in use. Indeed, the drop is more than can be accounted for by the decrease in use of the 'roads, pointing to one bright spot in the railway predicament. There is a rapidly rising productivity factor. Most of it is due to a whopping post-war $15 billion investment ($818 million in 1959 alone) in labor- and time-saving equipment.

Two thirds of this has been spent on rolling stock, primarily diesel conversion. Improved yards and lading facilities were assigned a goodly portion, and modernized accounting and centralized traffic control equipment received significant amounts. Far down on the list of expenditures and yet well up on the list of equipment that has more than paid for itself, are some compressed air tools and their compressors and auxiliary apparatus.

COMPRESSED air braking systems for trains are one of the most vital uses of the power medium by railroads. They have been largely responsible for the outstanding safety records, and have added considerably to operating efficiency.

Compressed air is used in other ways that have played a big part in compensating for the rise in costs. There are three fields that are served by air under pressure: maintenance-of-way, maintenance-of-equipment and yard operations.

The job maintaining tracks, bridges and rights-of-way has always called for a lot of manpower. The labor shortages of the war provided the impetus for the 'roads to find new methods. Results were so encouraging that considerably more progress has been made in the years since.

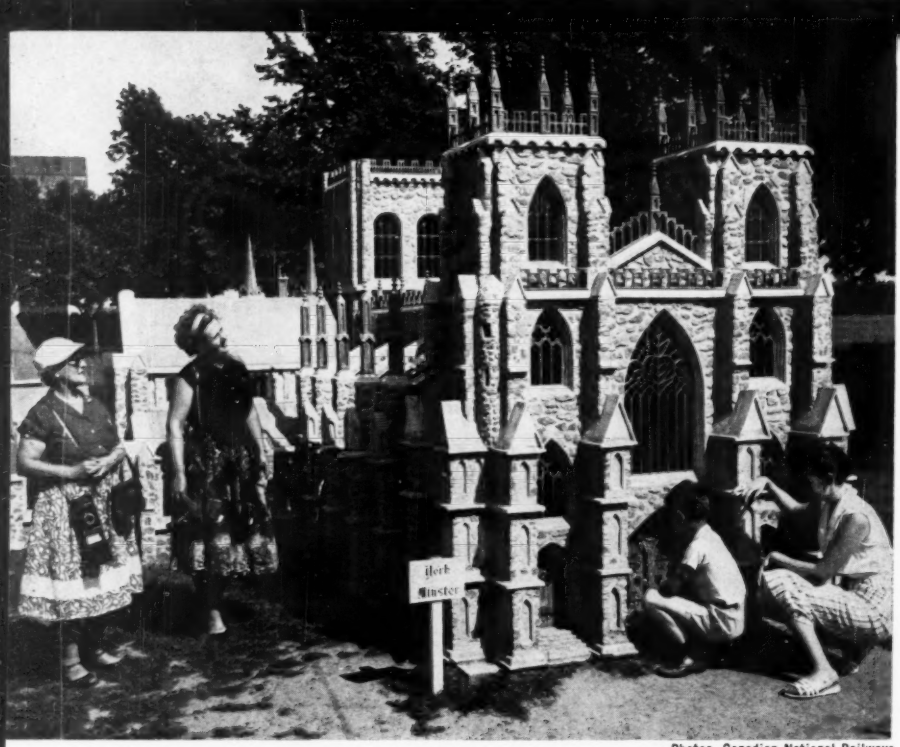
In the early 1950's, *Compressed Air Magazine* described a multiple tie tamper that enabled one man to do the work of sixteen. Entirely air-operated, the machine has since been improved and its working rate speeded. Today there are machines for every maintenance-of-way job resulting in some interesting manpower-requirement figures. For example, "putting up track" (replacing worn ties, realigning and reballasting the track) on one road used to require crews of about 125 men. Using the new machines, a force one-fifth that size does as much or more work in the same time.

Besides the tie tampers, air-operated spike drivers and a variety of miscellaneous pneumatic tools (hoists, wood borers, impact wrenches, etc.) are included. Even air-powered rock drills are put to work installing new bridges and driving tunnels to shorten hauls, as well as carving big rock cuts to reduce grades.

Keeping rolling stock rolling is another task for compressed air's economies. With studs and bolts of 2-, 3-, and even 4-inch diameter being common on railroad equipment, removing or running their nuts with manual tools calls for long wrench extensions and, frequently, for battering rams as well. In one case, a giant-sized portable pneumatic tool costing more than $1000 replaced these and paid for itself in less than 1 hour's work!

There are countless smaller nuts that represent time savings of only a few seconds each when run with pneumatic tools. Yet, the total may be many thousands of man-hours per year. Repainting, cleaning, even scrapping of old equipment are all speeded by air power.

BOTTLENECKS, one philosopher has opined, are almost always at the top, but on railroads, the major bottlenecks are at the ends: a train may make a record run, but to no avail if cargos can't be handled quickly at the terminals. Piggybacking is one expediting step. Automatic car spotting and pneumatic retarding equipment do even more. Air-powered vibrators are used to speed the unloading of hopper cars, and air conveying makes it possible to unload gondolas in quick order. Pneumatic dunnage drastically reduces labor at loading docks and the number and degree of damage and breakage claims.



Photos, Canadian National Railways

YORK MINSTER

Land for the Lilliputians

SEEKING the illusionary "different" in vacations may lead you to the smallest, but perhaps the most English of the Canadian provinces, Prince Edward Island. Wandering along its byways you might come across Woodleigh and the spacious gardens of Lt. Colonel E. W. Johnstone. In that true English tradition of liking to "putter about, just making things," the Colonel has directed his craftsmanship to recreate to scale historic buildings that are famed throughout the world.

One of the most attractive miniatures in the Colonel's garden is the 12-foot stone model of Glamis Castle, birthplace of Princess Margaret. There are many other dwarf-sized structures of historic significance: Stokes Poges Church, celebrated by Gray in his *Elegy;* Shakespeare's birthplace; and the romantically thatched, picket-fenced Ann Hathaway Cottage, which is shown here getting a repair job on its roof by Johnstone. Also illustrated on this page is Penn Manor House, which has age-old Anglo-American associations.

Our third picture from this cosmopolitan land of make-believe is York Minster, the largest medieval cathedral in Northern Europe. The replica—complete with chimes—is 26 feet long, 9 feet high, and 12 feet wide. Colonel Johnstone has used more than 2 tons of lead; thousands of pieces of colored glass and tons of specially selected granite in this 1-to-20 scale model.

PENN MANOR HOUSE

ANN HATHAWAY'S COTTAGE

Transistor Assembly

FOR years the transistor industry remained a dwarf because of the tediousness of making the miniature electronic components. They had to be hand assembled and tested. The recent phenomenal splash of activity has been made possible largely because reliable automatic machines have been devised.

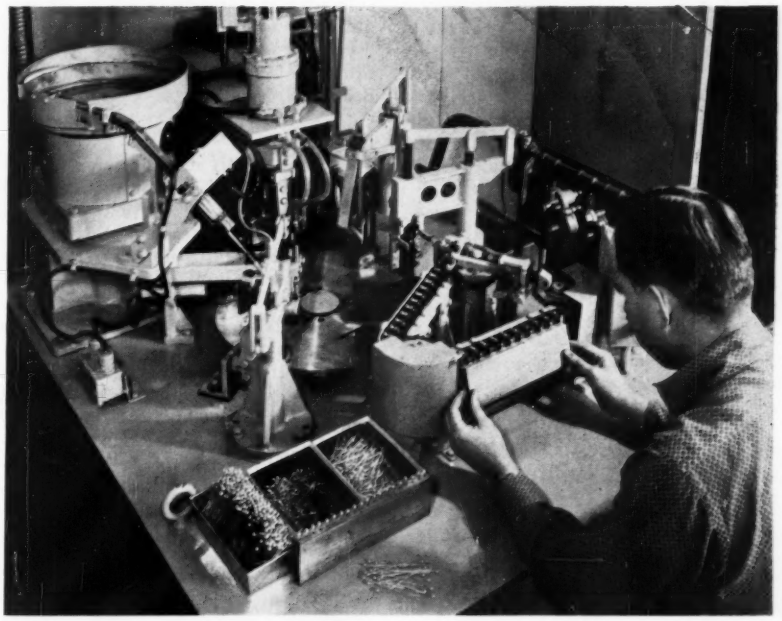
One such machine is an automated welder produced by Precision Welder & Flexopress Corporation, Cincinnati, Ohio. The machine can weld 1850 transistor bases an hour. A compressed air piston is used on the instrument to raise the electrode so that the parts may be loaded and to lower it for gentle clamping afterward.

The welder is mounted atop a 5-foot-square table and centered about a variable speed indexing turntable. Six manufacturing operations are used:

1. An operator inserts ten transistor bases to form a moving chain.
2. A fixture removes each base from the chain, gathers the wire leads, and inserts the assembly into an electrode on which the base rests.
3. Caps delivered from a hopper are automatically assembled on the bases.
4. A photoelectric sensing station checks to see that each cap is correctly mounted on a base, and stops the machine in the event of a malfunction.
5. A 10-kva C-frame welding unit welds the cap to the base. This is the welder that is raised and lowered by compressed air.
6. Welded assemblies are ejected machanically to a chute.

The welder is kept in a controlled atmosphere because welds must be gas-tight. The table top provides a leak-proof base for a dry box that covers the machine. The transformer and turntable drive are mounted below the table and a separate cabinet houses the welding controls.

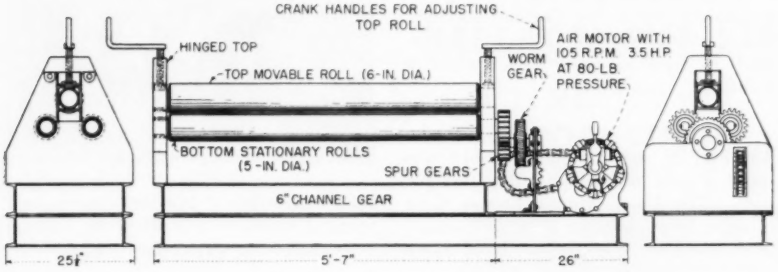
SAVING WITH AIR POWER APPLICATIONS



WELDER An operator loads ten transistor bases into the first station of the automated welding machine. When they are welded four steps later, compressed air will raise and lower an electrode. The machine has an output of 1850 bases per hour. Open here for a test run, the welder is normally kept in a dry controlled atmosphere.

BENDING PLATE

THE plate bending machine shown below was originally built completely from salvage components found around a mine shop. The rolls were old shafting and the worm gear came from a Mancha locomotive. The air tugger (motor) had been blasted underground then rebuilt by welding. The inventor, A. E. Alpine, Plainfield, N. J., reports that he has distributed dozens of prints of the machine during the last 20 years. The rolls on the original machine have operated since 1939 without major maintenance.

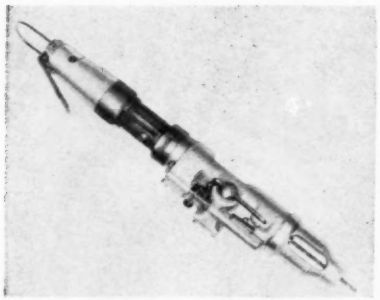


Air tuggers or motors are ideal as drivers because they provide the needed versatility of operation. They can be reversed instantly, retarded or speeded-up at will. If an overload occurs, the air motor simply stops without being damaged. On working compound or 2-radius bends, the operator is able to "creep" up to the tangent line and then reverse instantly, producing a smooth bend.

Alpine has found that used air motors have a write-off value about 25 percent of the cost of the electrical equipment that would be needed. (Such electrical equipment would include a motor, a speed reducer, and some component to provide reversal at any moment.) Air power, therefore, saves 75 percent in the cost of a major item on the machine.

Industrial Notes

MECH-FEED drills produce clean, precisely located holes that are said to be so true and clean that reaming is seldom necessary even in tough materials. There is no bulging on breakthrough and constant feed decreases the amount of burr at the hole rim. Even when drilling at difficult angles, holes



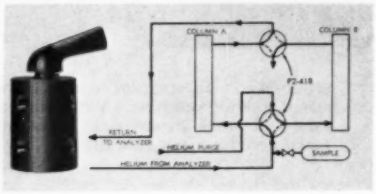
can be precisely located and misalignment problems are therefore eliminated. These air-powered drills have a wide range of feed and speed adjustments and greatly reduce operator fatigue.

The Ingersoll-Rand unit consists of a Multi-Vane air motor powering the positive feed mechanism. A twist drill is automatically fed into the workpiece at a predetermined rate until a preset depth is reached. Twist drills cannot wobble or run out in tough materials. Five rates of feed are obtainable—2, 3, 4, 6 and 8 thousandths inch per twist drill revolution. Changeover from one feed rate to another can be done in the toolroom by a minor gear change, thus taking the rate of feed out of the hands of the individual operator. The uniform feed, compatible with the material being drilled, results in more holes from each twist drill sharpening. It eliminates drill burning and reduces breakage caused by work hardening in certain materials.

Operator fatigue is substantially reduced since the operator does not have to exert any force to feed the drill into the work. A durable rack and pinion drive provides smooth, positive advancement of the drill point.

Mech-Feed drills are available in twelve speeds from 450 to 4500 rpm, two power ranges, straight or offset handles, and 0 to $^{5}/_{16}$-inch drill chuck capacity. Forward travel and quick-return are very simple to adjust from 0 to $1^{1}/_{4}$ inches. Feed is engaged by a sturdy jaw-type clutch. *Ingersoll-Rand Company*, 11 Broadway, New York 4, N. Y.

A DUAL 4-port selector valve, Model P2-418, is available from Circle Seal Products Company. It may be used with air, vacuum, carbon dioxide, helium, hydrogen, nitrogen, oxygen, hydrocarbons, etc. Simple 90-degree rotation of a single handle actuates both valve components simultaneously and permits reversal of flow direction of two fluid systems through two alternate systems. (Plugging one port in either of the dual valves converts it to 3-way operation.) In a typical application, the Model P2-418 can be installed between the alternate columns in a chromatographic analyzer circuit where, by a 90-degree rotation of the handle, either column can

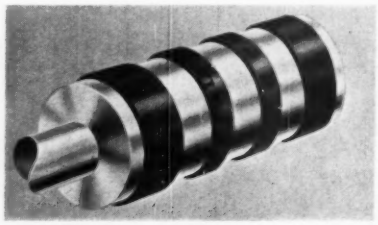


be used while the other is being purged or backflushed. Unique use of resilient O-rings precision-fitted into specially machined grooves eliminates body and cross-port leakage. The fixture is easy to operate and requires no adjustments, it is reported. Limited flow passages and minimum dead volume are other features that make this valve suitable in helium or other gas test systems. Model P2-418 is available in either aluminum or 303 stainless steel, and will operate at temperatures from −40° to 350° F, dependent upon the O-rings specified. *Circle Seal Products Company, Inc.*, 2181 E. Foothill Boulevard, Pasadena, Calif.

ISOTOPES are becoming more and more a part of today's industrial picture. The U. S. Atomic Energy Commission has published a revised version of its booklet, *Special Sources of Information on Isotopes* (TID-4563), which helps clarify the mass of data available to industry. The 51-page publication lists more than 300 information references and their availability. The references were selected as the most comprehensive or informative items from the thousands of reports, articles, and other documents published about the nature and uses of radioactive and stable isotopes by the AEC, its contractors, other government agencies, and the commercial, scientific and technical press. Also included are a number of titles and the availability of translations of important foreign publications. Reference listings are broken into fourteen major areas of interest and include general publications, basic texts, isotope use in industry, and information for management. TID-4563 is available without charge. *U. S. Atomic Energy Commission*, Office of Isotopes Development, Washington 25, D. C.

STANDARD methods of specifying for purchase of round-edge steel are explained in a 10-page booklet that gives definitions and size classifications of round-edge material and outlines the finishes available. Included is a table of U. S. gauging, showing thicknesses in fractions and in decimals to four places. For each gauge number the weight in pounds per square foot is listed. The publication points out advantages of round-edge materials for manufacturers of automobile accessories, bicycles, metal furniture, beds, scales, vending machines, file cabinet accessories, barrel hoops and other products. *Caine Steel Company*, 5501 W. Grand Avenue, Chicago 39, Ill.

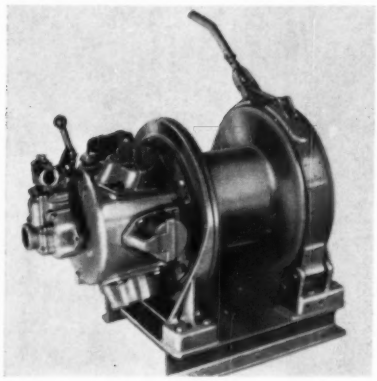
FILLED TEFLON piston rings, offering all the chemical and mechanical advantages of this versatile fluorocarbon, are ideal for nonlubricated service. They seal reciprocating, oscillating and rotary motion of both external and internal cylindrical surfaces against the leakage of liquids or gases. They are made from specially processed carbon-filled Teflon which exhibits a lower coefficient of friction than any other



solid material. Having exceptional thermal stability, the rings are suitable for continuous service in a temperature

range from —420° F to 500° F. The rings are tough, abrasion-resistant and have the ability to imbed hard foreign particles without adversely affecting the cylinder life or the ring itself. Mechanical strength and dimensional stability are excellent, it is reported. The rings are available in many different designs including butt joint, step joint, scarf cut or solid design. Matched filled Teflon rider rings are also available for use in conjunction with the rings where long stroke or heavy pistons necessitate additional support. *The Garlock Company,* 444 Main Street, Palmyra, N. Y.

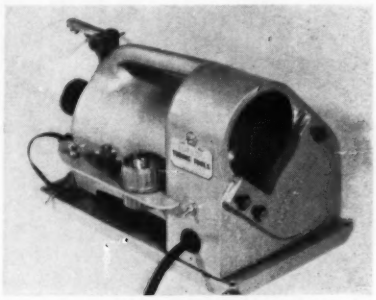
UTILITY HOISTS capable of handling maximum loads of 7000 and 5000 pounds have been developed by Ingersoll-Rand Company. The air-powered units, called K6U and K6UA Single-Drum Utility Hoists, reportedly have greater capacity than any other single-



drum air hoist produced in the United States and retain the same portability and adaptability of smaller units. They are designed to handle the heavier loads on erection, maintenance and materials handling jobs, without multiple reeving. Both hoists are equipped with reversible 6-cylinder air motors with infinite speed graduation provided by the throttles. A self-energizing brake supplements the reversible motor for positive control. At 80-psig air pressure, the Size K6U has a rated capacity of 7000 pounds with average lift speed of 65 feet per minute. The size K6UA is rated at 5000 pounds and 95 feet per minute. Drum capacity of each is 600 feet of $^{5}/_{8}$-inch wire rope or 400 feet of $^{3}/_{4}$-inch wire rope. Controls for completely remote operation are available as optional equipment. *Ingersoll-Rand Company,* 11 Broadway, New York 4, N. Y.

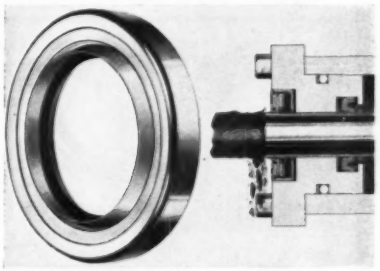
WIRE CLOTH fluid filter elements are described in a 4-page brochure published by Bendix Filter Division. Designated No. 142, the booklet discusses typical fluids and systems that can use Poromesh and Micromesh wire cloth filters. Details of design features, environments, construction, performance and metals for these wire cloth filters are also covered. Photographs and line drawings illustrate typical elements, wire cloth filter element construction, and manufacturing techniques and facilities. *Bendix Aviation Corporation,* Bendix Filter Division, 434 W. Twelve-Mile Road, Madison Heights, Mich.

COPPER TUBING and fittings can be cleaned and deburred with Toled-O-Matic No. 1 Buff-Ezy. The machine will clean and deburr tubing to and including 4 inches. A 4-inch main brush, with adjustable "reverse L" guide, handles all external cleaning operations. For internal work, three sizes of brushes and a rotary internal deburring tool work off the other end of the motor shaft under a clear plastic protective guard. The device eliminates slow, costly handwork, assures tight connections, prevents leaks and reworking operations. It is also useful for cleaning threaded fittings, internal threads of valves, etc. Fitted with a handle and weighing only 52 pounds, the unit is completely portable, although it is provided with a heavy metal base plate for bench mounting. The machine is $10\times10\times17^{1}/_{2}$ inches and is equipped with a $^{1}/_{8}$-hp single-phase motor that operates on 115-v, 60-cycle current. A handy rack on the side holds



extra brushes and a hand reaming and chamfering tool. *The Toledo Pipe Threading Machine Company,* Toledo, Ohio.

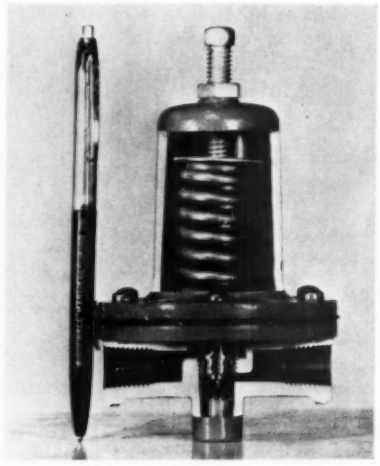
A ROD WIPER SEAL that incorporates both a rod wiper and a scraper within a single unit is called the SC Wiper Scraper Seal. It is said to provide effective, low-cost protection for packings on reciprocating shafts and hydraulic cylinders exposed to heavy dirt conditions. The seal consists of a thin brass scraper ring in tandem with a pliable Sirvene (synthetic rubber) wiping member, both firmly clamped within a compact steel shell. The outside di-



ameter of the scraper ring has sufficient play within the outer shell to permit realignment and tolerance of any off-center conditions of the rod. No special

machining for grooves or retaining rings in steel cylinders is required. The scraper removes frozen or caked mud, tar and other materials firmly stuck to the rod, thereby prolonging packing life, protecting bore finishes and reducing equipment down time. According to the manufacturer, field tests have proved the performance of the seal. *Chicago Rawhide Manufacturing Company,* Oil Seal Division, 1301 Elston Avenue, Chicago 22, Ill.

A VERSATILE instrument regulator, applicable where ever a controlled supply of air or gas pressure is needed, has been introduced by Rockwell Manufacturing Company. The "080," as it is called, has a wide range of applications in commercial, industrial, and utility operations. It is especially suited for air supply lines for production line equipment such as punch presses, pneu-



matic tools, paint sprays, etc. In the plant or field its applications can vary from controlling inlet pressures on sensitive controlling, regulating, and recording devices to a first-stage regulator for

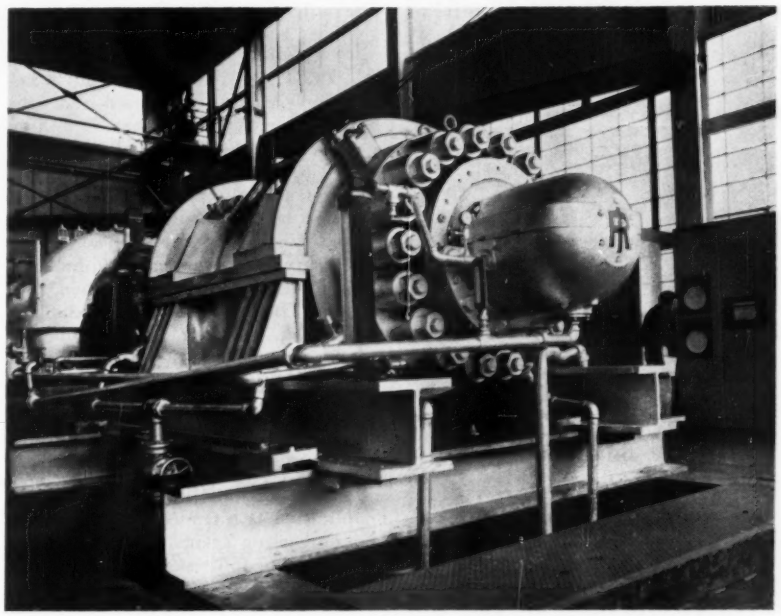
"Any more questions?"

LPG systems. Constructed of pressure die-cast aluminum, the "080" has a maximum inlet pressure of 250 psig and outlet pressure ranges of 0-5, 5-35 and 35-100 psig. Optional construction includes a handwheel adjustment and a $^1/_4$-inch side outlet tap for pressure gauge mounting. *Rockwell Manufacturing Company*, Meter & Valve Division, 400 N. Lexington Avenue, Pittsburgh 8, Pa.

FLEXIBLE HOSES used in air and materials handling, dust collection and fume control are discussed in *Technical Information Bulletin No. 92*, a publication of the Flexaust Company. The 24-page bulletin gives considerable information in detailed form to help engineers concerned with the problems of selection, performance, and installation. A few of the subjects covered are physical characteristics, pressure ratings, friction loss data, and end finish for connections. *Callahan Mining Corporation*, The Flexaust Company, 100 Park Avenue, New York 17, N. Y.

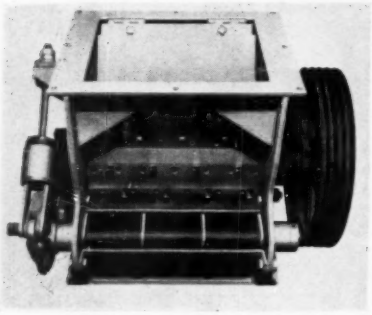
TRIUMPH is a single-roll crusher for reducing any friable material, even if the material is mixed with noncrushable matter. It is ideal for breaking up substances that have a tendency to cake or become encrusted in processing, according to a report from the manufacturer.

WORLD'S LARGEST BOILER-FEED PUMP



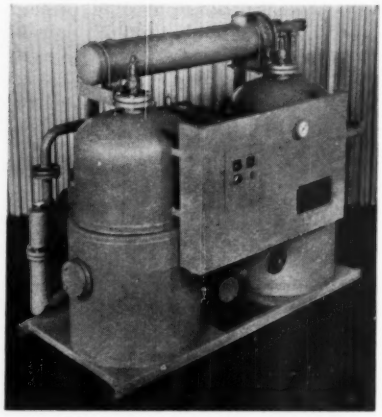
Pictured here is the world's largest boiler-feed pump in terms of capacity and horsepower. Slated to go into service late this year at American Electric Power's new 450-MW generating unit at Philip Sporn Station, the pump is shown on test at the manufacturer's hydraulic test facility. The Ingersoll-Rand unit is rated 7200 gpm at 4550-psig discharge pressure. Driven by a 22,000-bhp steam turbine, the pump will handle singly the full boiler feed load of the new generating installation. The selection of this giant full-capacity pump is a continuation of American Electric Power's policy of purchasing large, single units to serve their new turbogenerators.

Tramp metal, rocks, stones, etc., pass right through without damaging the machine or slowing it down. Because noncrushable foreign material can pass through the unit, it can be used in many places where larger, heavier and more expensive hammer mills are usually required. An air-cushioned breaker bar serves as a release mechanism for foreign bodies in the material. It absorbs shock overloads to prevent strain on wearing parts. Only 15-20 hp are required to power the unit (high starting torque motors are used if the crusher is started under load) to handle from 6- to 10-pound-per-cubic-foot material per hour. The size of the material being discharged can be adjusted while the machine is in operation. (In the photograph above, the front panel is removed to show the interior.) *The C. O. Bartlett & Snow Company,* 6200 Harvard Avenue, Cleveland 5, Ohio.

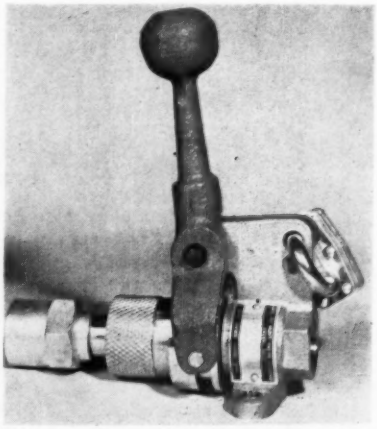


A TECHNICAL reference on industrial socket screws is believed to be the most complete ever compiled. The illustrated 82-page booklet includes standard catalog data and extensive design and performance information on a family of fasteners used in virtually all industries. Titled *Unbrako Socket Screw Catalog and Engineering Standards,* (Form 2335) the publication covers more than 2800 items. These include socket-head cap screws, set, shoulder and button-head screws, pressure plugs and socket screw keys. Additional product lines revised are Unbrako square set screws and dowel pins. Designed to answer many of those questions which have lead to salesman "callbacks" through the years, and to aid in user value analysis, the publication is intended as a handy aid for purchasing agents, design engineers and production people. *Standard Pressed Steel Company,* Jenkintown, Pa.

COMPRESSED AIR, or other gases, can be dried effectively with the Type BZ Lectrodryer, a dual absorber, pressure-reactivated unit. The unit is simple and modern. Parts are interchangeable; the few moving segments of the unit are easily accessible, simplifying maintenance. Operation is automatic. Working on a 6-hour cycle, the device absorbs moisture, heats for regeneration, and cools with no more attention than occasional lubrication. Adequate instrumentation permits checking the operation at a glance. *McGraw-Edison Company,* Pittsburgh Lectrodryer Division, Thirty-Second Street, Pittsburgh 30, Pa.



TWO VITAL functions result from the locking feature on Hunt Valve Company's line of sliding sleeve valves: the elimination of maintenance work hazards on air-operated machines with live air in the system (the 3-way version exhausts downstream air when in the "off and exhaust" position); and, preventing the potential danger of a machine losing its air pressure at the wrong time. The valve also conserves air during long shutdowns. The valve can be locked, with padlock, in both "off and exhaust" and "on and flow" positions with or without the exhaust shield. For use on the main inlet header of all machines utilizing compressed air, the units are available in 2- and 3-way actions, manual or spring return. Tap sizes are $1/8$ through 1 inch. *Hunt Valve Company,* Salem, Ohio.



THIS is a pressure regulator. It is operated by pressure applied at any point around its circular tread, and can therefore be pushed by the foot to the most comfortable position, and operated without taking the eyes from the work. The regulator is a self-relieving type, built for the pressure control of air and inert gases to 125 psig and flows to 2 cfm. It is sturdy, but compact, measuring only 5 inches in diameter and somewhat less than 2 inches in height. The housing is steel with a black, corrosion-resistant finish. A rubber pad on the base protects the floor from damage and prevents the unit from accidentally sliding. A rubber surface on the tread protects the unit from abrasion and minimizes the possibility of the operator's foot from slipping off the surface. The device is provided with 10 feet of flexible twin plastic tubing, $1/8$ x $1/4$-inch, to be connected to supply and output lines. The device is ideally suited for dead-end test work, or for the speed control of pencil-type air tools such as are used in tool and die finishing and engraving. *A. L. Hacker Company, Inc.*, P. O. Box 5642, Baltimore 10, Md.

AN 8-page illustrated bulletin, No. PL 12-8-160, gives engineering data on Clark Type CY magnetic starters. Available in a range of sizes from 0 through 4, the starters feature sturdy construction, simplicity of design and fast, easy maintenance. The Clark arc quenching principle, used on the size 2, 3 and 4 starters, and said to provide greater contact life under heavy current loads and severe arcing conditions, is fully described and diagrammed. The enclosures, forms and combinations of Clark CY starters are also shown. *The Clark Controller Company*, 1146 E. One Hundred Fifty-Second Street, Cleveland 10, Ohio.

Books . . .

Non-Newtonian Fluids (published by Pergamon Press, Inc., 122 E. Fifty-fifth Street, New York 22, N. Y.; 4 & 5 Fitzroy Square, London W.1, England; 24 Rue des Ecoles, Paris V, France; or Am Salzhaus 4, Frankfurt, Germany) is subtitled "Fluid Mechanics, Mixing and Heat Transfer." It is the first volume of

the publishing company's international series of monographs on chemical engineering and was written by W. L. Wilkinson, Lecturer in Chemical Engineering at the University College, Swansea, Wales. The monograph discusses the properties of the so-called non-Newtonian fluids—those materials frequently encountered in chemical processes but which exhibit anomalous flow behavior. Special reference is made to the design and operation of the process equipment for handling these fluids. Recent advances in the field are also included. Although the volume is presented in a form that is readily understandable, it is not a book for readers who are unfamiliar with the engineering applications of fluid mechanics and heat transfer as applied to Newtonian systems. 138 pages. Cost, $6.50.

Engineering Thermodynamics (published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y.) was written by James B. Jones, professor of mechanical engineering, Purdue University, and George A. Hawkins, Dean of Engineering, professor of thermodynamics and director of Purdue's engineering experiment station. It is a classic text that will serve both as an introduction to the subject, and as a review for those who have lost touch with it. The book is full of explanations and illustrations of the fundamentals of the science, and special emphasis is given the known stumbling blocks for students. Proceeding from "Fundamental Concepts and Definitions"—the first chapter —the volume becomes more and more technical, closing with chapters on gas power and vapor power cycles, refrigeration, binary mixtures and heat transfer. Each of the 21 chapters—arranged pedagogically for easy learning—ends with a summary and a list of specific references. 724 pages. Cost, $8.50.

COMPLETE PROTECTION FOR YOUR EQUIPMENT with DRIAIR

All New Jersey Meter DriAir Units are complete and self contained. DriAir Separators are the answer to many problems which arise in various applications of compressed air. They speed production by separating and automatically ejecting the condensed water and oil from the air. They reduce wear and prolong the life of tools by collecting dirt and rust and by promoting good lubrication. DriAir units are entirely automatic and require no separate traps or other accessories.

High Pressure Units for 300 lb. lines
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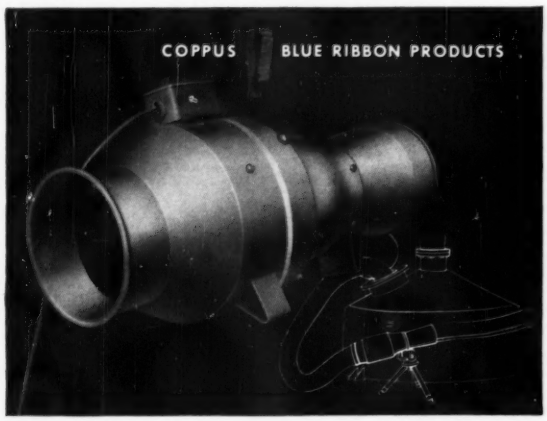

COPPUS "Blue Ribbon" Ventilator-Exhausters are portable and easily adaptable . . . for exhausting welding fumes or foul air from enclosed vessels. Mail coupon below for facts.

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- ☐ in tanks, tank cars
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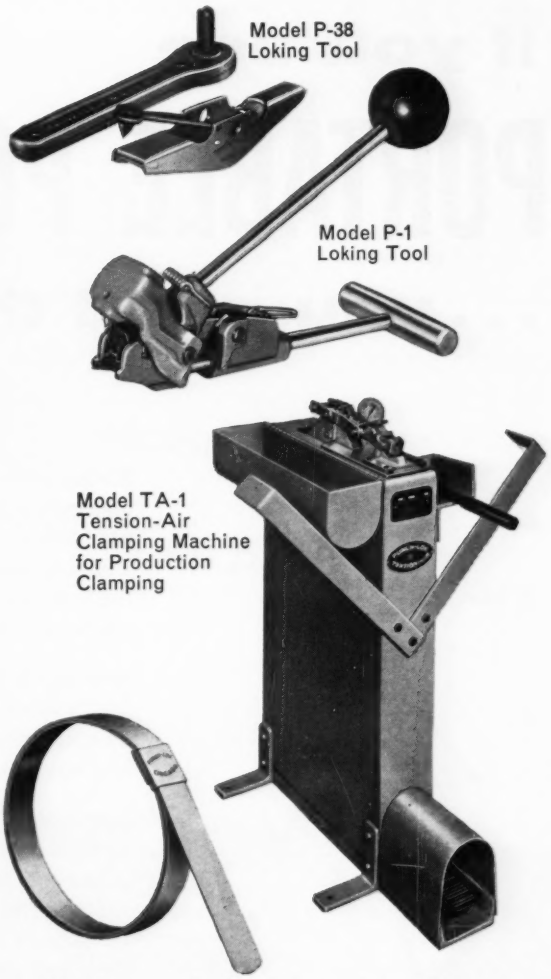

A Complete Line for Your Hose Clamping Requirements

There is a PUNCH-LOK Hose Clamp and clamping tool for every need. All PUNCH-LOK clamping tools are dependable, easy to operate, and apply to any size PUNCH-LOK Clamp. Simple, manually operated types will handle general hose maintenance requirements—the Tension-Air Machine provides high-speed, long-run clamping production.

The Sign of a GOOD Hose Clamp

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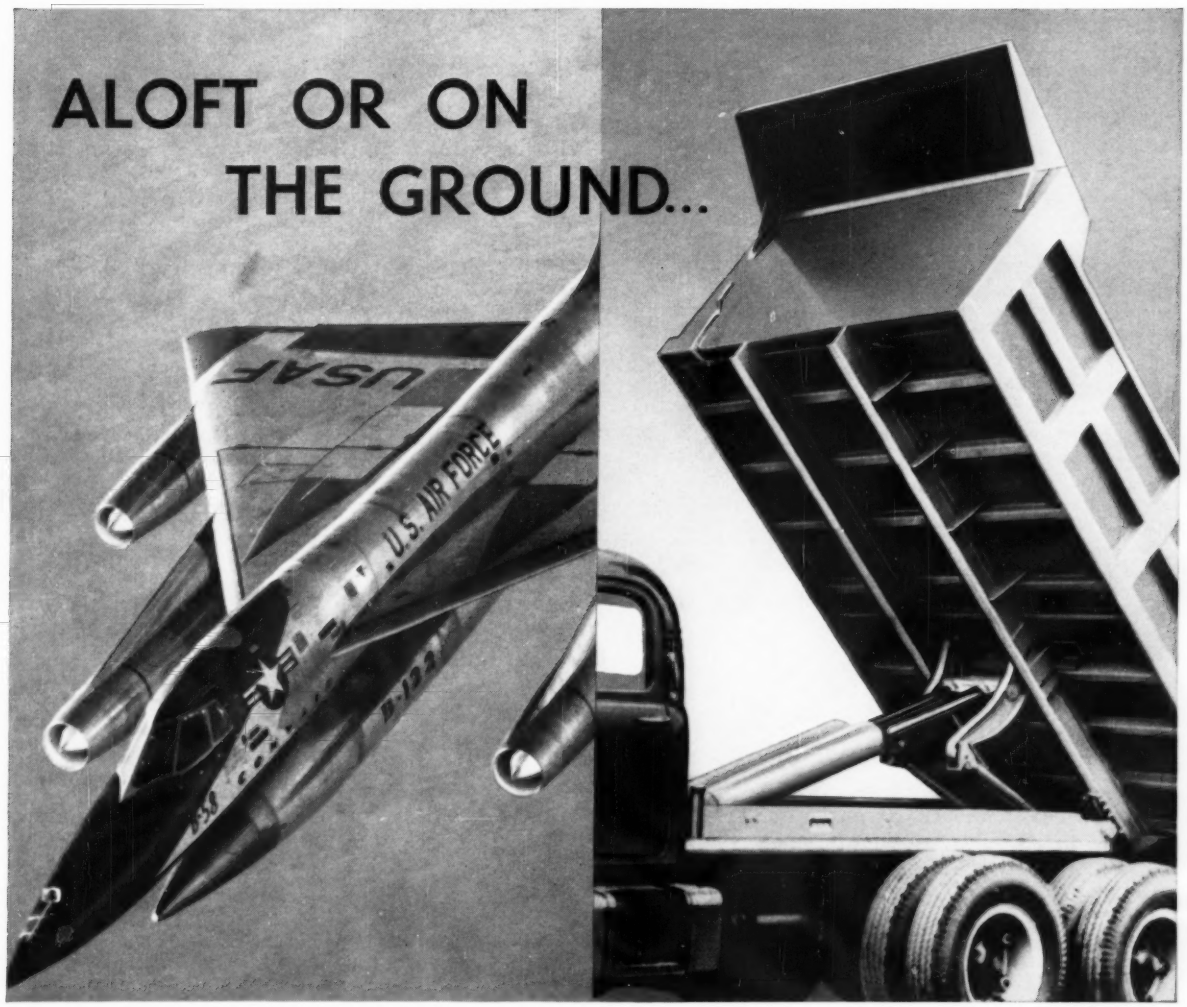

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Koppers solves diverse and difficult sealing problems.

Modern supersonic jets and dump trucks—as dissimilar as they appear—both depend on Koppers Sealing Rings for efficient hydraulic system operation. Koppers *Predictable Performance* Sealing Rings are used in a wide variety of applications . . . engineered to satisfy each requirement of both hydraulic and pneumatic sealing.

Koppers has the technological skill, gained through 38 years of experience, to meet the most critical performance requirements in any sealing application. Look to Koppers to solve your sealing problems. For an informative booklet on Metallic Sealing Rings write to: KOPPERS COMPANY, INC., 6107 Hamburg Street, Baltimore 3, Maryland.

A Koppers Sealing Ring is applied to a B-58 actuator.

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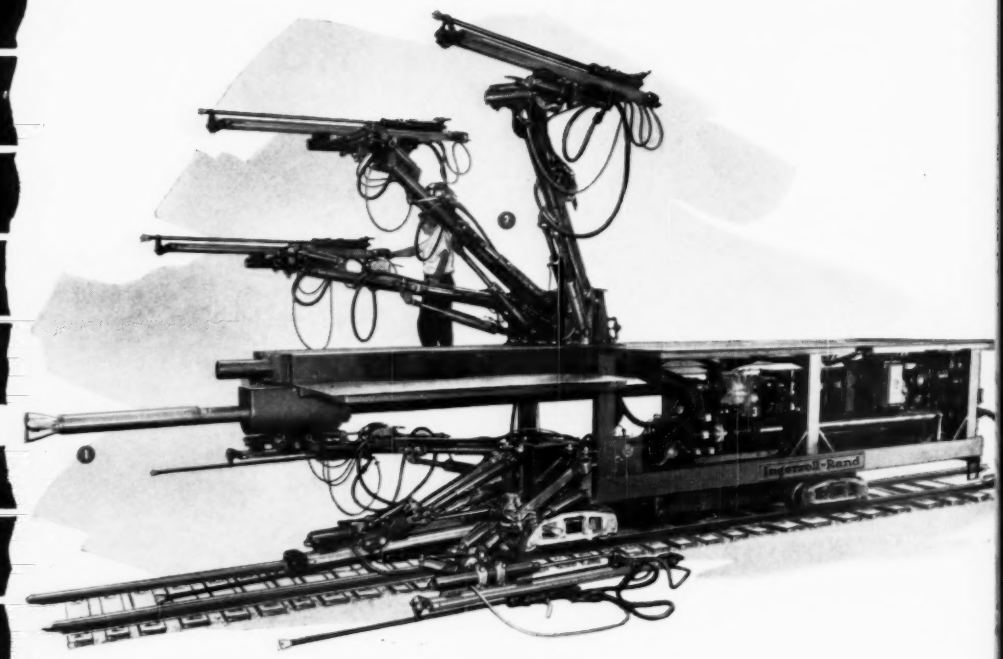


How Ingersoll-Rand's NEW

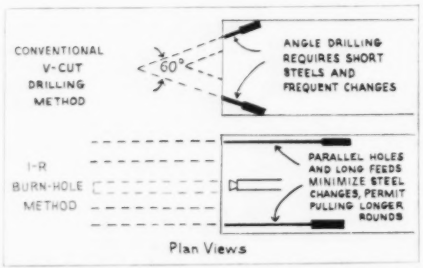
BIG BURN-HOLE METHOD

drives tunnels 20% to 30% faster

On seven major tunnel projects, the new I-R Burn-Hole Method has already *proved* its superiority – increasing the rate of advance as much as 30% over previous drilling methods. Here are three reasons why.

1. DHD Burn-Hole Drill – Heavy-duty I-R Down-hole Drills are *designed* for 6" to 10" diameter Carset bits, and are not overworked 4" bit machines trying to drill 6" to 8" holes. The I-R machines drill big burn holes fast, *without overloading*, even in the hardest rock. They stay underground – no costly delays due to broken couplings, drill steel, rifle bars, nuts, pawls, etc. As shown on the diagrams below, the I-R burn-hole method can eliminate steel changes and permit pulling longer rounds with no overall increase in cycle time.

2. I-R Hydra-Booms give smooth effortless hydraulic control of all blast-hole drill positioning, with maximum safety and dependability. And Ingersoll-Rand can supply heavy-duty drifters, reversible aluminum shell screw feeds up to 144" or air-driven chain feeds to any desired length.



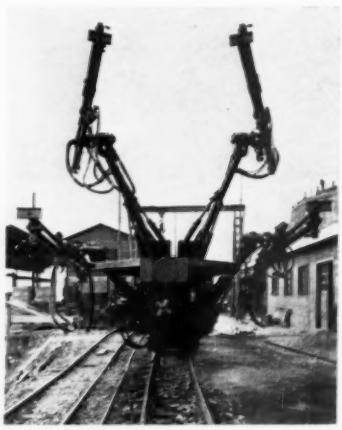
Plan Views

3. Fog Eliminator, designed and perfected by Ingersoll-Rand electrically heats the drilling air, eliminating fogging at the work face, promoting safer working conditions, providing better drill lubrication and saving concrete by getting rid of wild holes. In addition, preheating the air increases its pressure, providing additional energy for more efficient drill operation.

If you want to speed tunnel driving and cut drilling costs, look into the new I-R Burn-Hole Method. Ask your Ingersoll-Rand engineer for complete information today.

Current and recently completed famous tunnel jobs using I-R burn-hole method

Delaware Aqueduct – 14 foot bore – 2 Jumbos (*First major "highball" tunnel job ever to use the I-R "big burn hole" method and I-R Fog eliminator.*)
Italy – Three hydro-electric jobs – 25 feet bore
France – Mont Blanc Tunnel – 33 foot bore
Malaya – Hydro-electric job – 12 foot bore
Wachusett Marlboro Tunnel – 17½ foot bore
Chicago – Columbus Avenue Tunnel – 14 foot bore
Pyrenees – Hydro Electric Project – 12 foot bore


Tunnel jumbo with DHD Burn-Hole Drill and four Hydra-Boom mounted drifters.

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A CONSTANT STANDARD OF QUALITY IN EVERYTHING YOU NEED FOR DRILLING ROCK